THE

ELECTRICAL REVIEW.

VOL. LV. OCTOBER 21, 1904. No. 1,404.

ELECTRICAL REVIEW.

Vol. LV.] CONTENTS: October 21, 1904. [No. 1,404.

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THE

UNIVERSAL ELECTRICAL DIRECTORY

1905 Edition

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H. ALABASTER, GATEHOUSE & CO.,

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Telegraphic Address: "AGEEKAY, LONDON." Code, A B C.

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ELECTRIC LIGHTING AND HEATING.

ALTHOUGH gratifying progress is taking place in the applications of electricity for driving machinery and factory equipments, and for the operation of tramway and railway systems, the electric lighting department of the electrical industry continues to rank as one of the most important. Naturally, with so much interesting development taking place in a variety of other directions, electric lighting does not monopolise the attention of the electrical engineer to anything like the same extent as it did, say, a decade or 15 years ago; nor is its progress accompanied by as much attractiveness or sensationalism as, of necessity, are surrounding the more recent applications of electricity, which surprise the public as important discoveries are carried into practical effect. But, be that as it may, no one can be blind to the facts that the electric lighting section of our great industry is continuously engaging the minds and hands of tens of thousands of workers throughout the kingdom, and that the manufacturing and contracting firms who are responsible for installation and wiring work are numbered by the thousand. Perhaps we may give some vague notion of the extent of the business by mentioning that in the London area alone there were, a year or two ago, more than a thousand firms interested in the electrical contracting business. Doubtless since then some of them have given up the ghost—the victims of their own and others' competitive undercutting, which may perhaps be regarded as a natural corollary of an over-crowded business; but, if we deduct a small percentage in respect of these departures, we must also take into account the never-ending stream of new-comers who swell the ranks of those dependent to a large extent upon electric light and power development.

The continuous annual increase in the output of units from our three or four hundred public electricity supply works, and the myriad new private installations of which but little is ever heard, are vitally necessary if all, or nearly all, of these firms are to be kept a-going.

If a few moments' serious consideration be given by the general body of our readers to thoughts such as these, we do not think that we shall be charged with ascribing an exaggerated importance to electric lighting and its development.

The greater part of this issue of the ELECTRICAL REVIEW is devoted to illustrated descriptions of a host of new designs of electric lighting fittings, heating and cooking apparatus, and kindred appliances and devices which have been produced by a variety of our manufacturers, and we venture to believe that the collection of this material in its present form cannot but be of value to those concerned in the carrying out of installation work and in the buying, selling and specifying of electrical apparatus. But while so many pages have had to be set apart in this way, the technical, financial and commercial developments of electric traction and other sections of

electrical engineering have not been excluded. The reader who closely follows these lines from week to week will not therefore feel that, though this is a "Special Electric Fittings" issue, his interests have been neglected.

While we think that the issue is quite capable of speaking for itself, we would express a belief that to many it will be a useful desk companion and record throughout the present lighting season.

Car Drivers and Car Driving.

On another page in this issue there appears a report of a County Court case of a quite unusual character, which we think will prove interesting reading. We refer to the claim of an electric car driver against the Potteries Electric Traction Co. for compensation for injuries to his hands, alleged to have arisen from the severe character of the employment in which he has been engaged, involving the total loss of the use of his hands. The medical evidence produced set up a theory that muscular atrophy was caused by holding a cold metal lever in all weathers during five years' employment as car driver, aggravated by vibration. The claim was made under the Workmen's Compensation Act, and fell to the ground. As Judge Mulholland, K.C., said, it was impossible to say when the injury first began, as it seems to have come about slowly and gradually at some time or other during the engagement of the plaintiff in the defendants' service. The case is one giving rise to some perplexity, but the decision in favour of the respondents seems to us to be quite correct. Every car-driver knows well enough when he enters upon such a calling that he will have to suffer exposure to severe weather, will have to stand certain physical strain, and be subject to any inconvenience that may arise from vibration. One can only wonder whether the plaintiff's physical fitness was all that it should have been, when he was engaged by the company for an occupation which makes heavy claims upon a constitution which is not cut out for it. The matter possesses particular interest at the present moment in view of the discussion which has recently taken place, respecting the hours and conditions of labour of tramway employés, and as to the methods of selecting drivers. The case is, we believe, the first of its kind that has arisen—at any rate in this country—although electric tramways have been operating here for considerably more than a decade; so it is not unreasonable to suppose that there has been no very serious effect caused upon the general body of car-drivers in the control of heavy and fast-speed cars. But there may be something to say on the other side of the subject.

British Weights and Measures.

The British Weights and Measures Association has been formed "to combat the Metre," and "to standardise and simplify British Imperial Weights and Measures." We note on the Executive Committee the names of Messrs. R. Kaye Gray, W. M. Musgrave, T. Parker, and J. Paxman, with other well-known engineers; Mr. G. Moores is the secretary, and the offices are at 25, Victoria Street, Westminster.

The question of weights and measures is a most contentious one, and there is no doubt that strong opposition will have to be overcome before reforms are introduced into our national system of chaos. We are pleased to see by a footnote at the end of the brochure just issued by the Association, that its opposition is confined to the metre and its derivatives, and that the decimal system is not objected to. It follows that, if this Association in time becomes representative of the feeling of the party opposed to the metric system, there will, at least, be a general agreement in favour of the decimal system, independently of the larger question.

The brochure contains many of the arguments usually advanced against the metric system, with the usual selected examples of calculations which are simple when expressed in inches, but complicated when in millimetres. Precisely similar examples can, of course, be readily adduced, showing exactly the reverse condition. It seems to be supposed, too, that, *e.g.*, crown octavo, now $5 \times 7\frac{1}{2}$, will always be of the same dimensions, although in mm. it would be $126{\cdot}997 \times 190{\cdot}496$. Say rather, it would be 125×200—for slight modifications of this kind would be made, as a matter of course. Is crown 8vo paper now $5 \times 7\frac{1}{2}$, or is it $4{\cdot}99999 \times 7{\cdot}50001$? Let us be at least as accurate on the one system as the other! —but it is news to us that paper is measured to the $\frac{1}{1000}$ of a millimetre.

Thus silly arguments can be met with silly answers, for we do not consider the foregoing as anything better. As regards the convenience of the British mil (not *mill*—surely its supporters ought to know how to spell the word!) we may point out that it is quite common for engineers to work to an accuracy of three or four mils, or to half a mil, as the case may be; one may, therefore, just as easily work to the $\frac{1}{10}$ mm., or the $\frac{1}{1000}$ mm., whichever is preferred, and the latter being a trifle smaller than the half mil, is quite suitable for this purpose.

Some startling estimates are given of the enormous costs that would be incurred in effecting the change from British to metric measures in engineering works, and the fact that all tools of precision, of the kinds that would have to be altered, are constantly being worn out and replaced in the ordinary course, is ignored. It must be admitted that the period of transition would be inconvenient and troublesome, but we can hardly accept the low estimate of the intelligence of the British nation which is evidently held by the authors of this pamphlet.

However, while the arguments advanced by the Association will convince only those who wish to be convinced, we are not disposed to dogmatise on the metric system itself. The prime object of reformers ought to be the simplification of our existing codes, eliminating all inconvenient and superfluous ratios, and inculcating the use of decimal calculations.

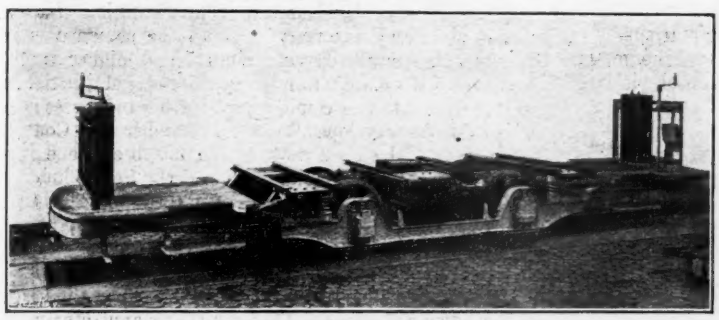
We note that the Association's programme includes the removal of the "customary"—*i.e.*, vexatious and confusing—weights and measures in certain trades, and we cordially welcome their efforts in this direction.

The Use of Electricity in Factories and Other Places.—The Home Secretary has issued a draft of regulations which he proposes to make in pursuance of Sec. 79 of the Factory and Workshop Act, 1901, for the use of electricity in factories and other places under that Act. In the circular accompanying the draft regulations it is stated that "for some years past certain requirements directed to securing the safety of the public have been imposed by the Board of Trade in all instances where undertakers have sought powers to supply customers with electricity at pressures exceeding 250 volts, and such supplies are now given to some thousands of factories under those conditions. Instances, however, have been brought to the notice of the Secretary of State, in which failure to observe the conditions laid down by the Board has resulted in serious and sometimes fatal accidents to persons employed in places under the Factory Act, and he has considered it to be desirable to give to certain of the requirements of the Board the force of regulations under Sec. 79 of the Factory Act, as a provisional measure pending the issue of a more complete code. The effect will be to make the occupier, or consumer, responsible for their observance. The present draft regulations are based upon the requirements of the Board without any addition, except by way of relaxation. They will apply, however, not only to works now subject to those requirements, but also to the use of electricity generated on the premises or taken from an outside source not under Board of Trade control. The dangers in both cases are the same. The intended regulations are provisional only, and cover only part of the ground which will eventually have to be dealt with. They do not contain all the precautions which the Secretary of State is advised may be necessary, nor do they apply at all to the generation or transformation of electricity." The regulations require, *inter alia*, that where the normal working pressure is greater than 250 and less than 650 volts between any two conductors, all wires in connection with the supply shall, where practicable, be completely enclosed in strong metal casing, and where this is not practicable they shall be so arranged that there shall be no danger of any shock or of fire; that all main and branch circuits shall be protected by switches, and by fuses or other automatic cut-outs; and that all switches and cut-outs shall be so enclosed and protected, or be in such positions, or of such construction, that there shall be no danger of any shock being obtained in the ordinary handling thereof, or of fire being caused by their normal or abnormal action."

WORM REDUCTION IN ELECTRIC TRAMWAY EQUIPMENTS.

By O. F. DOMON, M.I.E.E.

Mr. Reckenzaun was, if I am correct, the first to propose, in the eighties, the use of worm reduction gear in the electric equipment of tramcars. I do not know what resulted from the attempts he made in the United States and England. At about the same time Oerlikon took the matter up and equipped 12 of the first cars for Marseilles with worm reduction gear. After a year's experience it was abandoned, and replaced by the present usual spur reduction gear. The reasons of the abandonment were many, but were not mainly special to the gear itself; the cars had turned out to be 30 per cent. heavier than was calculated, so that the motors were overloaded; the worm gear itself was far inferior to the present standard design and manufacture, but still showed very little wear. It was possible to move a car by hand, a proof of the excellence of the worm gear then made.



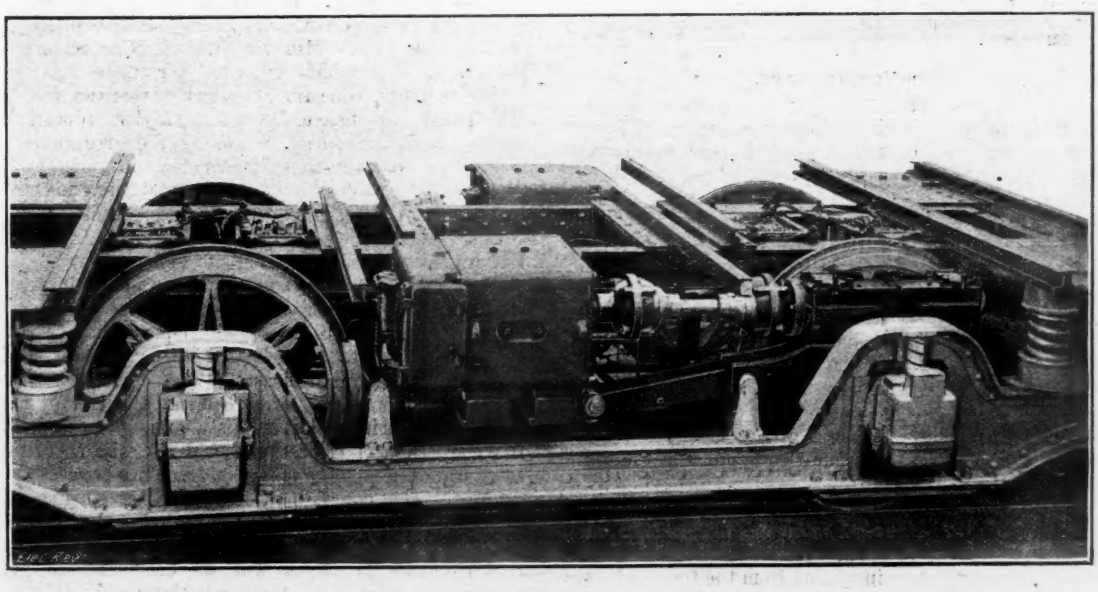
General View of Worm-Geared Motor Truck.

Since that time, but for other purposes, such as crane, hoist and lift work, the calculation, design, and manufacturing methods of worm gear have been greatly improved. Such is the perfection arrived at, that the efficiency, reliability, and little wear and tear of the gear in its manifold applications, under all sorts of working conditions, have proved so satisfactory in the long run that the Oerlikon works have been induced to make a renewed attempt to apply the improved worm gear and other contrivances to tramcar equipments, and to that end, a new car was recently put on the Seebach-Oerlikon-Zürich Electric Tramway for trial. This car, a description of which is to follow, is now in actual use on the above-mentioned line, to enable an exhaustive comparison of wear and tear and reliability to be made with the remaining spur-gear cars running on the same line with the same schedule.

Besides the wear and tear question, which is sure to turn out to the advantage of the worm reduction gear, it has already been possible to ascertain that the worm reduction car runs more smoothly than the cars with spur gear, and, besides this, without noise from gears, and without the hammer blows caused by the heavy motors being rigidly journalled on the car axles. Moreover, with exactly the same controllers, the transition from one speed to another is smoother, which is accounted for by the higher speed and lighter mass of the motor.

The energy consumption tests have shown that there is practically no difference between the two systems in this respect, which means that the overall efficiency is the same. The greater efficiency of the higher speed motor makes up for the small deficiency in the worm compared with the spur gear. When the car is running down grade by its own weight, the efficiency (backward) of the worm is less than that of the spur gear. The difference is illustrated by the fact that the worm gear car will start running down a grade of 1 in 100, whilst the spur reduction car will start on only $\frac{3}{4}$ in 100, track conditions and car weights being equal. This backward efficiency is of quite secondary importance, and would only have to be taken into consideration if the use of regenerative principles were contemplated. On the other hand, it reduces the tendency of the car to race away.

The main features of the new equipment with worm reduction gear are, besides the improved worm gear with its ball thrust bearings, the flexible and insulated connection between the worm and the motor shaft, the insulation of the motor itself, and the position of the motor at the side of the truck, which makes it accessible from the side without the use of pits.



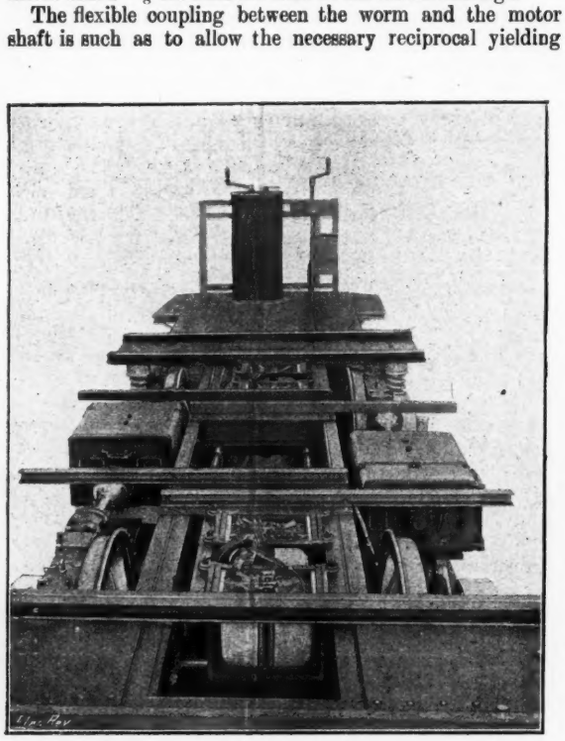
Motor and Gear Box, with Flexible Coupling.

In the car equipment referred to the two motors are fixed *insulated* on the suspended frame of the truck, and transmit each 20-H.P. measured on the tire, the motor running at 1.200 r.p.m. for the standard speed of 9½ miles an hour. The worm reduction gear fixed on the extended axle outside the car-wheel secures quite smooth running, and especially starting. The worm has a right-handed treble

thread, with a pitch of 120 mm., corresponding to 29° 55′, pitch diameter, 72 mm. Number of teeth of the worm wheel 36, pitch 40 mm., pitch diameter of wheel 458·6 mm. The reduction is, therefore 1 : 12. The thrust bearings of the worm are ball bearings.

In order to secure a sufficiently low specific surface pressure, adequate lubrication and minimum wear and tear, the worm gear has to be designed of much greater strength than would be actually necessary if designed only according to calculations of resistance with the usual factor of safety, which means an extra strong gear. The whole is enclosed in a cast-steel case, the worm wheel runs in oil, and oil rings ensure the lubrication of the quick-running worm and motor shaft. ⅝-in. balls are used in the thrust bearings.

The flexible coupling between the worm and the motor shaft is such as to allow the necessary reciprocal yielding



End View of Truck.

between the motor, which is on the spring-suspended frame, and the worm gear connected with the car wheel axle. There is, therefore, no transmission of jolting and shocks from the reduction gear to the motor, and the bearings of the motor have no lateral strain to support as with the spur gear, which certainly favourably affects the wear and tear of the motor bearings, compared with the spur gear arrangement.

As previously mentioned, the motor is insulated from the frame and from the reduction gear, so that an accidental leakage in the insulation of the motor itself does not necessarily at once interfere with its working, as it does not make an earth.

The accompanying illustrations give a clear view of the general arrangement of the tramcar equipped with the worm reduction gear.

To recapitulate, the advantages demonstrated by the use of the worm reduction gear in car equipment are: noiselessness, smooth running and starting, increased reliability of the motors by reason of their insulation from the frame, absence of side strain in the motor bearings, no transmission of the axle and gear jolting to the motor, and accessibility of the motors for inspection and repairs from the side without the use of special pits.

Meter Litigation.—With reference to the notice which recently appeared in our columns to the effect that the Westinghouse Co. are commencing an action against Messrs. Ferranti, Ltd., for infringement of meter patent, we are asked to state that Messrs. Ferranti are defending the action, and are giving indemnities to anybody thinking it necessary to have them.

UNIVERSITY EDUCATION IN COMMERCE AND ENGINEERING.

By A UNIVERSITY LECTURER.

Some interesting correspondence has passed between the London Chamber of Commerce and the Board of Education concerning higher technical education.

Stated briefly, the Manufacturers' Section of the Chamber—which represents 600 employers of labour—passed a somewhat epoch-making resolution, which has been approved of by the Council of the Chamber. The resolution states that "it is absolutely necessary to raise the standard and, if possible, cheapen the cost of technical and higher technical education" if we are "to retain our industrial position, and to introduce into this country such further industries as may be profitably developed." The Chamber of Commerce acknowledges the good work which has been done in the past by the City and Guilds Institute, the Polytechnics, and the County Councils—but it evidently thinks that that is not enough. It wants elementary, secondary and technical education to be more connected with each other.

We are, however, more concerned with the vigorous onslaught of this body of commercial men upon the lethargy of their own colleagues. They say that manufacturers have not sufficiently realised that there is a scientific aspect to every branch of manufacture; that the study of chemistry and electricity requires a *regular* course of three or four years of concentrated work in addition to the ordinary higher class education; that there is not an industry that would not benefit from the more general employment of specially qualified scientific assistants; that such men are at present only obtainable from the Continent; that more university technical colleges are needed; that the fees should be reduced and the scholarships increased; that all students should be compelled to matriculate; and, finally, that such institutions for teaching applied science would practically save British industries! Whatever else may be said about the Chamber of Commerce, no one can help admiring the courage with which it has faced a thorny and difficult situation.

The reply of the Board of Education is sympathetic and, perhaps, encouraging. It refers to the deputation whose spokesman was the Chancellor of the University of Birmingham to the Prime Minister and the Chancellor of the Exchequer, and which appealed for more money for higher technical education. Local authorities have now full power to financially assist *higher* education in science and technology. The Board recognises the importance of full-time instruction in colleges, and apparently wants to see more advanced work done in the day teaching departments of the technical schools.

It is the manufacturers themselves, so says the Board of Education, who must encourage and employ technical graduates. It is only too true that many well-trained college men with great difficulty secure employment, because of the idea—often mentioned in the "Correspondence" columns of the Electrical Review—that they are not "practical." New methods have left old firms on the verge of bankruptcy, simply because these old firms had no scientifically trained assistants in their employ. It is a grand sign of the times that the Board of Education should recognise that through these causes a great amount of trade has been lost to the country. The disease has, in short, been diagnosed, the remedy prescribed—will the sick patient take the physic, however unpalatable it may be? Is it too much to hope that technical graduates will be demanded in greater numbers than has been previously the case? Or will the ostrich-like firms still bury their heads in the sand?

The parents of would-be engineers do not escape from the rebuke of the Board of Education. They expect their children to start earning money too early in life. Sufficient time must be spent in the secondary schools in order that a broad foundation of general culture should be laid. Careful attention to literary and linguistic training is necessary at this time, and without this general training students cannot profit by university careers. Experimental science and mathematics must be taught before the student matriculates.

Those of us who are in London recognise the evils that arise through lack of funds. Recently the writer made visits of inspection to provincial universities. It seems as if this London University is in an age of senility, for those vigorous cities of Liverpool, Birmingham, and the like, are leaving the metropolis behind. Local patriotism is stronger; they have obtained the money. Half a million pounds is required to bring the courses of instruction at one of our best known London colleges—King's College—up to date, but where are the men to be found who will follow the example of Chance and others at Birmingham, and hand over such sums as £50,000 each for technical education at the University? The London Central Technical College has done splendid work in the past—and, indeed, so has University College, Gower Street, but all these three constituent colleges of the London University are tremendously behind in their equipment. What are the facilities for research work? In Birmingham I saw a large power station with room for engines of 1,000 B.H.P.—they have 600 B.H.P. in running order—huge steel furnaces, a model mine, money being spent lavishly. But in London there is money wanted for proper laboratory apparatus. I do not know how it will be collected, but it *must* come soon, or, with the exception of those engineers trained in the two or three provincial centres *capable* of training them, there will be only Continental technical graduates competent to carry out the higher class of work. In London you have the brains, for there are none such as Profs. Unwin and Kennedy and others equally well known in the Metropolis at these provincial centres. In London you have nearly all the brilliant consulting engineers, most of them trained in London. In their day the colleges were, comparatively speaking, up to date. Now they all want more modern apparatus. Where will the money come from?

The London Chamber of Commerce seems to realise these things. Now that they have approached the Board of Education, let them put their views before the Councils of the various engineering institutions. The matter is urgent, our industrial supremacy is in danger, according to their own showing. Perhaps they will continue their efforts until they get something more tangible than sympathy from the Board of Education. They might get money for the university colleges, and promises of appointments for technical graduates from manufacturers. Such money would be well invested in providing better facilities for research work and instruction in the London university colleges.

I noticed the remarks of Mr. E. Kilburn Scott in last week's Electrical Review. If he takes the trouble to read this correspondence, he will see that neither the London Chamber of Commerce nor the Board of Education is satisfied with evening instruction only.

CORRESPONDENCE.

Letters received after first post on Wednesday morning cannot appear until the following week.

Unfair Competition.

With reference to the letters now appearing in the Electrical Review on unfair competition, &c., in getting appointments with firms advertising such, one of your correspondents, a Manchester firm, says—Let us have some practical suggestions instead. As one of those who have followed your advertisement columns for a long time, perhaps I may be permitted to make some suggestions.

First and foremost, let the firm requiring men advertise their name instead of a box number. Then people will not waste time in replying blindly to unsuitable openings. When invited to send full particulars of past experience, salary required, &c., it may be to a firm of the highest standing, or quite an insignificant concern. If the name of the firm were given applicants would, I think, be in a far better position to reply suitably.

I cannot understand why a firm should conceal their name in such cases; how can it harm them if all the world knows they are engaging men? One prominent firm at Bedford, I notice, frequently give their name, so it may be correct to infer that they always do so.

Then I suggest that you yourselves could do something for unsuccessful applicants. It is, perhaps, expecting too much that firms shall write separately to each applicant, when they may be any number up to 400, and few firms take the trouble to insert a notice that the vacancy is filled, paid for at the current advertisement rate.

But if you were to open a column of "Vacancies Filled," and insert merely the firm's name or box number *free of charge*, with an intimation at the top that firms are requested to notify you of vacancies filled, which when received you will put in this column, they might take the trouble to inform you.

The space occupied would not be much; and I feel sure you are ready to do your best for both parties.

In conclusion, I would draw your attention to an advertisement appearing in your paper a short time ago, in which a chief assistant electrical engineer was required at a small station in the Midlands. He was required to have two years' central station experience, requested not to send more than three testimonials, and offered £52 per annum.

On the same day a junior clerk was advertised for in the *Daily Telegraph* for a West End club, aged about 16; wages, 10s., with partial board, and no previous experience necessary.

Two Years.

London, *October 12th*, 1904.

A Mysterious Discharge.

I have just completed laying down a lighting plant at Messrs. George Adams & Sons, Ltd., at this address, and while running mains for incandescent lighting, encountered an interesting and rather mysterious phenomenon. The mains for lighting the mess room were laid from there to the generating station through a window—ends of wire coiled up and lying on the window ledge—(ledge lined with galvanised iron). About a week after these had been up I noticed a crackling noise, coming from the direction of the window, similar to that of a Leyden jar being discharged, and on a close examination found that an electrical discharge was actually taking place from the naked end of the mains. One end of the latter happened to be about ¼ in. from the iron ledge, and a spark was jumping across this gap. After "sparking" seven or eight times, the wire seemed to get discharged, but after a rest of, say, 10 minutes, the spark was as strong as ever again. On increasing the distance between the ledge and the wire, the spark increased to the extent of ½ in., and on touching the end of the wire with the finger a strong shock was felt. Examining the mess room, or outer end, of the mains, the current in these was found to be even stronger than that in the generating station. The mains go from there in a direction S.E., and are suspended on insulators fastened to poles about 20 ft. high, the length of circuit over all being about 100 yards of double cable. No moving wheels or machinery of any description whatever are passed over by this pair of mains. The mysterious current appeared in no less than four circuits at once, but the biggest spark obtained was from a pair of mains going from the generating station to one of the mill engines, in a direction S.W., distance about 120 yards. These wires cross the canal, a couple of puddling furnaces, a yard where a large quantity of pig-iron is stored, then on to a shed, ending in a junction box there; but, like the first mentioned, do not pass over or near any moving machinery; the height is about 20 ft. above ground level. A spark ⅝ in. long, very bright and thick, was obtained from either end of these mains to earth, viz.:—Corrugated iron roof of shed at the junction-box end, and bed of generator at the other, or even a nail driven into the plaster of the generating station wall. For an experiment, I ran a 16-gauge bare copper wire properly suspended from insulators parallel with these mains, and a spark was obtained from that. It was not quite so long, but very bright and thick—much thicker than the other. We also noticed on a bright day, with a moderate breeze, that the sparks were much longer and brighter than on cloudy days, when sometimes they were hardly discernible, while with the least drop of rain they disappeared altogether. The accompanying diagrams show length of spark from day to day, with the corresponding

atmospheric conditions. The current disappeared altogether at the beginning of last month, and although the mains were carefully examined every day up till the time they were connected to the switchboard, no trace of it has been seen since. The current had disappeared before the mains were connected in any way to the ceiling roses at the various points where lights were required. The cable used was Messrs. Johnson & Phillips's $\frac{7}{1}$'s gauge, 2,500 megohms, class N.A.

Perhaps you or some of your readers can throw some light on this matter.

S. Eden Green.

Mars Ironworks, Wolverhampton,
October 14*th*, 1904.

[Possibly the wires at some point passed through a current of air which had received a charge from a steam jet or from a similar source. Such phenomena have been observed in the case of telephone wires.—Eds. E.R.]

Direct Current Transmission at 70,000 Volts.

The article in the current number of the Elec. Review on "Direct Current Transmission at 70,000 Volts," is most interesting and instructive, but, in the writer's estimation, does not touch on the most difficult part of the problem of employing high voltage direct currents, viz., that of commutation. One is inclined to think that engineers *have* long recognised that the *transmission* of direct current compares very favourably with that of alternating current, but they have also seen that *generation and utilisation* at high voltage present difficulties which, so far, have been considered insurmountable. They have doubted if a commercial machine could be built which would give, say, 50,000 volts and commutate satisfactorily.

If Mr. Steens could give us some details of the behaviour of the machines used in the tests at Geneva, they would form a valuable supplement to the article referred to. Anyway, the working results of the St. Maurice-Lausanne scheme will be eagerly awaited by all engineers interested in power transmission.

E. A. Lambert.

Stowmarket, *October* 18*th*, 1904.

[If our correspondent will refer to the Elec. Rev. of September 12th, 1902, he will find on p. 463 a full illustrated description of the St. Maurice-Lausanne system of transmission of 5,000 h.p. at 22,000 volts, direct current. M. Thury, the engineer of the Compagnie de l'Industrie Electrique, long ago solved the problem of generating direct current at 5,000 volts on one commutator, and finds it as easy to couple his dynamos and motors in series as other engineers to couple them in parallel. His work has not received a fraction of the notice and appreciation that it deserves. He has carried out at least 20 such successful installations on the Continent, at various pressures.—Eds. E.R.]

The Value of Education.

Let your correspondent "Graduate" take the trouble to read my letter intelligently—if he can—and he will see clearly that I make no claim that evening classes alone are sufficient. The point I wish to emphasise is that, if there be time and money wasted on technical instruction, the average day student, and not the evening student, is the culprit. The article in your current issue on evening class instruction is timely and to the point.

I notice that "Graduate" brings forward the hoary-headed "damage to health" bogey once more. During 10 years' experience, I have never yet known a single case of illness due to overstudy. Certainly some students attempt too much, but I submit that it is the duty of the lecturer to prevent this as far as possible when the student enrols.

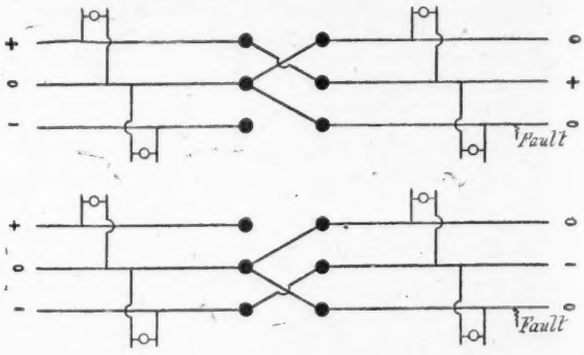
In conclusion, I would respectfully ask your correspondents "Graduate" and "University Lecturer" to substantiate their statements by giving a list of the cases of "damage to the health of evening students due solely to overstudy" with which they are personally acquainted.

Evening Student.

Groves: Localisation of Faults.

Replying to Mr. Abraham's flippant criticism of a portion of my paper in your last issue, I regret that there should be any ambiguity in the sentences to which he refers. I regret, also, that Mr. Abraham did not look for an alternative to the arrangement he shows in his diagram (*b*) before coming to the conclusion that I had written absolute nonsense.

The diagrams herewith, showing two methods of cross-coupling, explain themselves. The risk of breaking lamps refers to the possible blowing of the fuse (should one be inserted where the crossing is made) by the occurrence of a second fault on one of the outers of the system.



Mr. Abraham has carefully omitted the sentence in which this fuse is mentioned, from the context to which he takes exception. I did not consider it necessary to state that apparatus to which correct polarity was essential would also require crossing at the time the main was crossed, but apparently I have in this case also put too great a strain on Mr. Abraham's power of imagination.

W. E. Groves.

Birmingham, *October* 17*th*, 1904.

According to Mr. A. J. Abraham's letter in your last issue and detailed by him, it is quite obvious that the consumer (V. C.) in fig. (1) would get an excellent display of fireworks. But would it not be better to cross-couple as in fig. (2), working as on the two-wire system the faulty side of junction box? Of course, the same thing exists as regards reversing of meters and Mr. (2)'s Nernst lamp, but the most unpleasant duty would be avoided, namely, the interview with consumers (V. C.) fig. (1). I have not had the opportunity of trying the above (fig. 2) in practice, as my position is in the ranks of wireman, so I should be glad to have the opinion of authority. I think the sketch is sufficient to make clear my suggestion.

Lewin Fraser.

Bromley, *October* 17*th*, 1904.

[Fig. 1 referred to in Mr. Fraser's letter is identical with fig. *b* in Mr. Abraham's, and fig. 2 is identical with one of those given by Mr. Groves above. Mr. Fraser's suggestion is, of course, quite correct.—Eds. E.R.]

Re Edey v. Smith.

Referring to the article published under "Business Notes" in your issue of October 7th, we beg to point out that the parts referring to the Chelsea Electric Supply Co., and the absence of fuses, &c., are incorrect.

In the first place, there is the usual stipulation in our specification that the work is to be done to pass the test of the Chelsea Supply Co.; but as the contract is for wiring only, and not yet completed (owing to the mortgagees having taken possession and prevented us from doing so), the same has not yet been submitted for their approval. Secondly, our contract does not include switches, fuses, &c., although the wiring is done on the distributing $2\frac{1}{2}$-ampere circuit principle, and looped throughout.

The idea that no local authority would supply, and the question of short circuits, &c., is too absurd to need contradiction.

We shall be obliged if you will publish this in your next issue.

F. G. Edey & Co.
F. E. Edey.

29, Ludgate Hill, E.C.
October 18th, 1904.

[Address Wanted.—A correspondent wants to know the present address of Mr. Hickley, late of Southampton, the maker of Hiko commutator lubricant.—Eds. E.R.]

[We regret that, owing to our having to go to press earlier than usual this week, letters from Messrs. J. C. Stewart and J. R. Salter have been unavoidably held over to our next issue.—Eds. E.R.]

LEGAL.

Pestall *v.* Potteries Electric Traction Co.

At the Stoke County Court on October 12th, before his Honour Judge Mulholland, K.C., John Pestall, living at Crewe, brought an action against the Potteries Electric Traction Co. under the Workmen's Compensation Act. We are indebted to the *Stafford Advertiser* for the following report of the case:—

The grounds of the claim were that while the applicant was employed as an electric car driver by the company he lost the total use of his hands owing to exposure, vibration, the action of electric current, and brass-poisoning brought about by his handling of brakes, levers, &c., used in driving cars. Mr. H. S. K. Feltham, of Crewe, appeared for the applicant, and Mr. B. C. Brough (instructed by Mr. G. C. Kent) for the respondents.

Mr. Feltham said the point to be decided was whether an electric car driver sustaining injury in the course of his employment by the exposure of his hands in using levers and by the vibration on the brakes of the cars he had to drive, had suffered an accident within the meaning of the Act. The applicant was in a very serious position; he would never be able to do any more work. Both his hands were contracted, and his muscles were in such a condition that he would never again be able to earn his own living. There had been many cases in the courts to decide what was an accident within the meaning of the Act. In delivering judgement in one case, Lord Justice Mathew gave a definition of what was an accident under the Act. He said that to determine what constituted an accident one must discriminate between what "would" occur in the ordinary course of employment and what "might" occur. Something which "would" occur in the ordinary course could not be called an accident, but if the fortuitous and unexpected element came in, there was an accident. Mr. Feltham suggested that this definition might be good guidance in this case. He submitted that the fortuitous and unexpected had come to pass, for Pestall had suffered injury that "would" not occur in the ordinary course.

In answer to a remark by the Judge, Mr. Feltham said there were, unfortunately, a lot of men suffering in this way. The application of the brake caused a great amount of vibration on the right arm, and this was aggravated on cars where the brake skidded owing to the wheels having been worn flat in places. Such cars, going at full speed, might be described as leviathan buck-jumpers, and when the brake was applied the vibration must affect a man's hand. The car drivers were not protected as much as they might be, and he contended that if something happened which a man could not avoid and could not get out of the way of, then the unexpected and fortuitous did arise.

Pestall went into the box and gave evidence as to his condition, which is such that he cannot even dress himself. He was in the employment of the company from March, 1900, up to November last, when he was obliged to consult Dr. Storrar. He was in the infirmary from December 31st till April 1st. He was a married man, and was formerly an advertising agent for Messrs. Coleman.

Dr. Storrar gave evidence that the applicant would never be able to work again. The doctor discounted the "brass-poisoning" theory, but said that vibration certainly might have caused the plaintiff's injury. He thought the most probable theory was that Pestall's muscular atrophy was caused by holding a cold metal lever in all weathers during the years of employment as car-driver, aggravated by vibration.

Mr. Feltham suggested that there might be a small leakage of electricity from the controller of a car, and with a driver holding a metal lever in his other hand, a circuit would be formed, and the driver affected by electricity. He asked the doctor whether electricity could not escape.

Dr. Storrar: You get on a leaky car on a wet day, and you will know. The doctor added that there was no doubt that electricity could escape.

Mr. Feltham agreed, and said his suggestion might not be an impossible one. Knowledge of electricity was as yet only in its infancy.

Mr. Brough, for the defence, said the respondents' case was that there had been no accident within the meaning of the Act. Exposure to cold was the normal characteristic of the applicant's employment. As to vibration, everyone who got on a car had some vibration to submit to. The driver had more, but this again was a normal characteristic without which at present the employment could not be carried on. This vibration was in no sense accidental, fortuitous, or unlooked for.

In giving judgement for the respondents, his Honour said everyone sympathised with Pestall, but it was his duty to consider the law. The plaintiff's injury certainly could not be caused by the electric current or brass-poisoning. It might be caused by exposure, cold and vibration, but where could an accident be said to come in? Vibration must exist in all locomotive driving. The application of a brake must first cause vibration, and then, by pressure on the wheels, stoppage. Deafness produced by machinery, and lead-poisoning, were comparative cases. It was impossible to say when the injury first began, and, therefore, when an accident occurred. Whether or not that which the plaintiff suffered from came about in his employment with the company, he was satisfied that the injury came about slowly and gradually. It would be contrary to common-sense to call an accident that which took five years to happen, and only really happened after five years. His Honour recommended the plaintiff to the company's merciful consideration, and Mr. Brough promised that the Judge's remarks on this point should be brought before his clients.

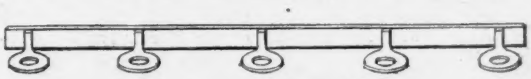
BUSINESS NOTES.

D.P. Batteries.—The D.P. Battery Co., Ltd., of 11, Victoria Street, Westminster, have just brought out a very fine new catalogue, which battery buyers ought to have before them. We note that in addition to their "Strip" type cells, which have been so long employed for country house plants and for low discharges, they are now listing and giving full particulars of their other types, which have for some time past been used where higher rates of discharge have been required, and for central stations. All these cells have cast Planté positives of enormous surface with a skin formation, and are of the hanging type. They are not in any way experimental plates, as they are the result of many years' experience both on the Continent and in this country, and have proved themselves most durable under all conditions of work. The D.P. Co. have recently brought out many improvements. In all types they have increased the space at the bottom of plates, thus obviating the

Planté Type Positive Plate.

necessity of cleaning out cells, due to deposit, and in the Lumford heavy and station types, special tube guides are used to keep the separators always in their proper position. In comparing the prices of the Lumford heavy and Lumford station types with other cells, the thickness and the weight of the plates have to be taken into account; as, all other things being equal, the life of a battery practically depends on the amount of lead used in its construction, it is claimed that in the long run these will prove most economical. In getting out this catalogue, the company have aimed at putting before customers all such useful information as will, in cases where there is little time for communicating with them first, enable them to get out quotations and specifications. The list is excellently laid out, has a convenient thumb index to the different sections, is well illustrated, contains very full dimensional drawings, instructions for erecting, and everything that a battery purchaser needs to have before him in deciding what he wants. The compilation of the book must have entailed a large amount of labour.

Brooks's Patent Flexible Curves.—Particulars have come to hand of some useful curves devised by Mr. W. J. Brooks, of 33, Fitzroy Street, W., for the use of draughtsmen. Pattern A is of celluloid or steel, and is provided with tabs at intervals along its length. By placing the fingers on the tabs, the curve can be firmly held in place while it is adjusted to the desired curvature, and the line ruled against it. For sizes above 8 in. long, weights or

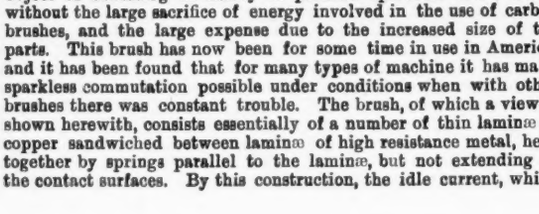


Flexible Curve, Pattern A.

drawing-pins are used to hold the tabs in position. This is a most useful device where the results of tests or calculations have frequently to be plotted. Pattern B is a steel strip with stiff-hinged linkwork attached, which holds the strip in shape, so that it can be transferred from one drawing to another, or turned over to draw the reverse curve. Patterns C and D are designed for a similar

purpose, but are of somewhat different construction; and all of them are extremely handy instruments, which we have pleasure in commending to the notice of our readers. Mr. Brooks has also designed a "parabola curve," accurately cut in celluloid, with the axis, focus and latus rectum engraved upon it. Besides the obvious uses of this curve in drawing, it has many applications in geometry, and can be used for finding the squares and square roots of numbers, and solving quadratic equations.

The Wirt Metal Brush.—There has been some discussion of late as to the advantage of using carbon brushes in dynamos to the considerable extent to which they have for some time been fashionable. This question has been considered for a long time in America, and was in particular made the subject of special study by Mr. Charles Wirt, who designed a brush with the object of obtaining as nearly as possible sparkless commutation without the large sacrifice of energy involved in the use of carbon brushes, and the large expense due to the increased size of the parts. This brush has now been for some time in use in America, and it has been found that for many types of machine it has made sparkless commutation possible under conditions when with other brushes there was constant trouble. The brush, of which a view is shown herewith, consists essentially of a number of thin laminæ of copper sandwiched between laminæ of high resistance metal, held together by springs parallel to the laminæ, but not extending to the contact surfaces. By this construction, the idle current, which



Wirt Metal Brush.

with ordinary brushes is liable to give trouble by sparking on the passage over successive commutator sections, is damped down by the high resistance metal which it first meets and last leaves, while the working current is conducted with a minimum of resistance by the central copper laminæ. The construction has the advantage of giving an extremely flexible brush with a constant and yet elastic contact. It is difficult to arrive on merely theoretical grounds at a conclusion in the comparison of brushes. It is a matter which can only be settled by actual practical experience; and in a large number of cases, dynamos which have sparked incurably under other conditions have worked quite satisfactorily with Wirt brushes. The brushes are stated to carry about 200 amperes to the sq. in., more or less, according to the type of brush-holder. The now considerable experience which has been had of them makes it probable that in any machine designed for metal brushes, and not working satisfactorily with them, a considerable improvement might be effected by the use of the Wirt brush. The sole licensees for the manufacture of these brushes in this country are Messrs. J. Defries and Sons, Ltd., of 146 & 147, Hounsditch, London, E.C.

Boilermakers' Society.—The monthly report of the Boilermakers' Society at Newcastle-on-Tyne says that with the close of the year the usual conditions have come involving a falling off of work and discharge of workers. The close of the past month has given a greater increase of unemployed than is usual even at this time of year, and the prospects for the coming winter are none too hopeful. Something is lacking in the organisation of industrialism when thousands of willing workers are without the work they wish to do, while at the same time the wealth of the country is increasing in greater ratio than the increase in population. There is an increase of 1,136 in the number of out of work members.

Diesel Engines.—According to a statement by Mr. Mark Robinson at the recent general meeting of Messrs. Willans and Robinson, Ltd., that firm proposes to take up the manufacture on a large scale of the Diesel engine. This is under a manufacturing arrangement with the Diesel Engine Co., Ltd., of 179, Queen Victoria Street, London, with whom the selling rights remain, and who will deal with all inquiries.

Books Received.—"Notices sur l'Electricité." By A. Cornu. Paris: Gauthier-Villars. Fr. 5.

"Annual Report of the Glasgow and West of Scotland Technical College." Adopted at the eighteenth annual meeting, held September 20th, 1904.

"On the Recent Contributions to our Knowledge of the Floor of the North Atlantic Ocean." By Sir John Murray, K.C.B., F.R.S., &c., and R. E. Peake, M.I.C.E. Extra publication. London: The Royal Geographical Society.

"Fire Tests with Partitions." British Fire Prevention Committee. 2s. 6d.

"The Electric Tramcar Handbook, for Motormen, Inspectors, and Depôt Workers." By W. A. Agnew. London: H. Alabaster, Gatehouse & Co. (Electrical Review). 2s. 6d. net.

"The Engineering Press Monthly Index Review." Vol. IV., No. 6. September, 1904. London: Technical Press Association. 1s.

Bankruptcy Proceedings.—The first meeting and public examination in *re* James Marsden, electric fittings manufacturer, 39-40, Woodcock Street, Birmingham, are to take place on October 26th and November 21st respectively, at Birmingham.

Dissolutions and Liquidations.—Messrs. George and Albert C. Hands (Hands Bros.) have dissolved partnership, and henceforth Mr. Albert C. Hands will trade under his own name at 30, Snow Hill, Holborn Viaduct, E.C., and is in a position to supply immediately all kinds of electrical goods as before. All accounts of the old firm will be attended to by Mr. A. C. Hands.

Mr. Geo. E. Teale, of 14, Golden Lane, E.C., was on September 28th appointed by the High Court receiver of the British Electric Calibrated Fuse Co., Ltd., on behalf of the debenture-holder.

A petition presented by a shareholder for winding up the Elmore Trust, Ltd., is to be heard in London on October 25th.

A petition for winding up the Motor Manufacturing Co. is to be heard on October 25th.

At a meeting of the Electrical Bleaching Co., Ltd., held at Nottingham on September 12th, it was resolved to wind up voluntarily, with Mr. W. B. Winnicott as liquidator.

The Traction Development Co., Ltd., is winding up voluntarily, with Mr. A. P. Ibbott, 9, Throgmorton Avenue, E.C., as liquidator. Creditors should send the usual particulars to Mr. Ibbott, by November 19th.

Creditors of the Bath Electric Manufacturing Co. must send particulars of their debts, &c., to the liquidator (Mr. A. C. Comley, Albion Chambers, Bristol) by November 30th.

A meeting of the London Telegraph and Steam Gauge Electric Co., Ltd., is to be held at 4, Romford Road, Stratford, on November 21st to hear an account of the winding up from the liquidator (Mr. J. R. Reedman).

Messrs. G. A. Smith and G. H. Huntsworth (Smith & Huntsworth, electrical engineers, 180, Regent Road, Liverpool) have dissolved partnership. Mr. Smith will attend to debts.

Messrs. G. Becker and Otto Böhndel (Schoen Bros., agents for electrical fittings, 29, Cock Lane, Snow Hill, E.C.) have dissolved partnership. Mr. Böhndel attends to debts.

Catalogues and Lists.—We have received from The Abner Doble Co., of San Francisco, an exceedingly interesting list, giving particulars and valuable details of their tangential ellipsoidal water wheels. Very useful data relating to head of water, jets, and waterwheels are included, and the various apparatus are well illustrated. Accompanying the above is a pamphlet dealing particularly with the Doble needle regulating nozzle, which also contains valuable data of special interest to users of water power.

The Electrical Co., Ltd, of 125, Charing Cross Road, W.C., have forwarded to us their leaflets Nos. 93 and 94 of small motors (ranging from $\frac{1}{50}$ H.P. and upwards) and polishing motors respectively. They also enclose a reference list of dynamos and motors supplied up to July 1st, 1904, with the towns in which they are located—from which we note that a grand total of 3,988 machines of 140,699 H.P. have been supplied.

The Mirrlees Watson Co., Ltd., of Glasgow, are circulating a list containing a brief description of the jet condensing plant supplied by them at the works of the Scottish Co-operative Wholesale Society, Ltd., of Shieldhall, Glasgow. The Society has a new well-equipped central power house, in which is generated electricity for driving the machinery in about 20 factories, and for lighting these premises which give employment to 7,000 hands. There are four water-tube boilers, three 400-KW. high-speed sets, and one 250-KW. set. The exhaust steam is led into a common exhaust main, and thence to the Mirrlees Watson independent condensing plant of the elevated jet type. The plant is designed to deal with 48,000 lbs. of exhaust steam per hour.

We have received from Messrs. Graham, Morton & Co., of Leeds, an exceedingly comprehensive catalogue containing particulars and excellent illustrations, too numerous to mention, of the varied work carried out by the firm, in conveying and elevating plant for large power, gas, and similar plants.

Messrs. Robt. W. Blackwell & Co., Ltd, of 59, City Road, E.C., have issued a circular pointing out the merits of Chisholm's Peerless Commutator Compound, supplied by them.

The Diesel Engine Co., Ltd., of 179, Queen Victoria Street, E.C., have forwarded us their current list, setting forth the advantages of the above engine, which we note are made in sizes from 20 to 1,000 B.H.P.

Messrs. Gloerfeld Bros., of Ludenscheid, have sent us particulars and prices of their cable and pipe cleats of various sizes.

A catalogue of the "Never Fails" portable electric lamps, which are adapted to numerous special purposes, has come to hand from the Sloan Electrical Co., Ltd, of 15, Fore Street Avenue, E.C. This firm also enclose Mr. Conradty's pamphlet dealing with carbon brushes for dynamos, motors, switches, &c., for which they are sole agents.

Messrs. J. G. Statter & Co., of Newhall Street, Birmingham, have issued a price list of laminated chopper switches, and particulars of the Pulsford electric incandescent lamp, for which they are agents.

Messrs. Holden & Brooke, Ltd., of Sirius Works, Manchester, have forwarded us a circular descriptive of the well known Brooke's patent exhaust head, together with sizes, prices, &c.

Messrs. Crompton & Co., Ltd., of Chelmsford, forward us their new 48 pp. catalogue of continuous-current motors, containing leading dimensions and weights, details of extras and spares, &c., together with prices of same. Particulars of pulleys and starters are also included.

Mr. Ed. Brand, wire working machinery specialist, of 35, Shakespeare Street, Ardwich, Manchester, encloses a list setting forth the advantages of his cold wire pointing machine, which is claimed to be a time-and-labour saving device, well worth the attention of wire drawers and others similarly engaged.

Messrs. J. Rhodes & Sons, Ltd., of Grove Ironworks, Wakefield, have recently published a booklet relating to their open-gap

power presses. One outstanding feature of this list is its reference to American competition, and the offer of the firm to send any standard size adjustable power press on approval to any intending purchaser to be placed alongside any press of American make. In addition to presses, the list particularises the Rhodes patent safety clutch, fingerguard, worm-wheel adjustment motion, &c.

An illustrated circular, relating to the Regina arc lamp, has been received from Mr. Rudolph Grunhut, 34, Gracechurch Street, E.C, who is the agent therefor.

Messrs. Beanland, Perkin & Co., of School Close Works, Neville Street, Leeds, send us a leaflet relating to their "Burnley's Rozinal Soldering Paste," which is used by many of the leading electrical manufacturing and other firms, and has increased enormously in popularity during the last few years.

We have received an illustrated pamphlet from The Mephan Ferguson Lock Barpipe Co., Ltd., of Tipton, Staffs., for whom Messrs. Stewarts & Lloyds, Ltd., of 41, Oswald Street, Glasgow, are sole representatives. The advantages claimed for the "Ferguson" patent lock-bar steel pipe for water, gas and other purposes are fully detailed, together with reports of tests from various authorities, &c.

Trade Announcements.—Messrs. Hodgson, Wright and Wood, of Halifax, have now moved to their new premises, and their address for the future will be Century Works, Pellon Lane, Halifax, to which all communications should be sent. The works are all on one floor, and are driven throughout by the firm's motors to the number of 10, the current being taken from the Corporation mains. Each department, and several of the tools, are driven by separate motors, so as to ensure the most economical working. A 5-ton electric crane is also provided in the machine bed, running the whole length of the works. The firm is making a speciality of turning out an efficient and well designed motor at a moderate price. Other specialities are electric winches, switchboards, starting switches, main switches, and fuseboards. The firm has recently completed a contract for eight electric winches for export, and makes a special line of these machines.

Messrs. Balcke & Co., condenser specialists, who were formerly represented in this country by Mr. Arthur Koppel, have now opened an independent branch under their own name, at 27, Clement's Lane, London, E.C. Messrs. Balcke's cooling towers are well known. Mr. C. Schmidt, who has been with the firm many years, has been appointed their London manager.

For family reasons, the business of Messrs. Green & Boulding, of 28, New Bridge Street, E.C., has been turned into a limited company, and the business of engineers, &c., will be in future carried on under the title of Green & Boulding, Ltd., under the same management, Mr. Sidney Boulding being managing director.

In connection with the notice of partnership dissolution respecting Messrs. Offord, Wilson & Barfield, which appeared on p. 577, of our issue of October 7th, we learn that the business will be continued under the style of Offord & Wilson.

The Electric Coin-Freed Meter Dimming Attachment.—This patented attachment is for adding a resistance in prepayment meters to prevent the lights being put out suddenly, and thus leaving people in the dark without any warning, when the amount of energy equivalent to the coins inserted has been consumed. By the addition of this attachment, warning is given by the light becoming gradually dimmer, thus obtaining the same result as a gas meter valve in prepaid gas meters, where warning is given by the gradual lowering of the light as the gas supply becomes exhausted. This advantage is obtained at very small extra cost. Several thousand meters are already fitted with the dimming device, and are in use at the present moment. The offices of the Electric Coin-Freed Meter Dimming Syndicate, Ltd., are at Albion Chambers, 11, Adam Street, Strand, W.C.

Fined.—The St. Helens Cable Co., Ltd., were fined 20s and costs for allowing an engine fly-wheel to remain unfenced. Counsel for the company said that the engine was fenced immediately they knew that it required to be done.

Brush Lighting Specialities.—The Brush Electrical Engineering Co., Ltd, of Belvedere Road, S.E., are issuing an interesting and attractive little Bulletin No. 4, drawing attention more particularly to their numerous specialities in incandescent lamps and fittings. This booklet covers ordinary, fancy and traction lamps, switches and accessories, and further illustrates a variety of residential, church, theatre, ship and factory fittings of striking design, which cannot fail to impress anyone who is following this line of the electrical industry.

The Horsehay Works.—The Horsehay Co., Ltd., of Horsehay, R.S.O., Shropshire, has issued a book of fine illustrations showing views of its works, where large steel and iron work is turned out. Wilson power gas plants are made, and Temperley patent transporters are constructed. The photographic views include the bridge shop and yard, fitting and machine shops, pattern shops, specimen spans of bridge-work for India, South America, Natal, Havana, Uruguay, and also for our own Great Western Railway. In steel building construction, views of a mill roof and a dome for a corn exchange are shown, while large cast-iron tanks, Temperley transporters, and a 1,000-ton Haulabout engine also have place. In regard to the Wilson patent power gas plant which has been erected at the Horsehay Co.'s works, this installation is capable of giving 500 B.H.P. daily working load, and it supplies a number of Stockport and Crossley engines which drive, either through shafting or by electricity, a large part of the Horsehay's Co.'s shops, and also supply the whole of the works and offices with electric light Bituminous rough slack is used at an average consumption of 1·25 lbs. of coal per 1-H.P.-hour, inclusive of the whole of the working fuel fed to the producers and boiler, the latter supplying the steam for the producers and auxiliary machinery in connection with the plant. Power station engineers, and also those who are responsible for the design of power station buildings, might find this brochure well worthy of their attention.

Exports of British Electrical Machinery.—Steady progress continues to be made as regards the exports of electrical machinery from this country. The returns for September last show a total of £47,777, which contrasts with only £42,380 in the preceding month, and £35,969 in September, 1903. For the first nine months of the year, the shipments have attained a value of £354,506, as against £331,822 in the corresponding period of last year.

Tramway Point Controllers.—Messrs. S. Dixon & Son, Ltd., have received an order from the Brighton Corporation tramways department to install their automatic point controller.

LIGHTING AND POWER NOTES.

Barrow.—A L.G.B. inquiry was held recently into the application of the T.C. to borrow £35,000 for electric lighting purposes. Dealing with this proposed further expenditure, the town clerk stated that the amount was made up as follows:—Buildings, £4,000; engine room plant, £5,750; boiler house plant, £6,750; clerk of works and contingencies, £1,500. This made the cost of the present extensions £18,000, and for additional further services another £5,000 had been added. The borrowing powers applied for, but not obtained, amounted to £12,097, making the total of £35,097.

Bedford.—An inquiry by the L.G.B. was recently held touching the application of the T.C. for sanction to borrow £44,950 for E.L. purposes. Intimation had been received from the Board that it would only sanction extensions for three years, and, in consequence, a statement was prepared by the engineer, representing £39,950 for the three years. There was no opposition.

Bexhill.—A L.G.B. inquiry was held recently into the application of the T.C. to borrow £3,500 for electric lighting purposes, and £1,100 to provide an electric pump at the sewage works. There was considerable opposition, and the inspector expressed dissatisfaction with the figures supplied to him.

Bishop's Stortford.—The U.D.C. has resolved to apply for a prov. order authorising it to supply electrical energy for lighting purposes within the district.

Burton-on-Trent.—The borough electrical engineer, Mr. P. J. Pringle, has recommended that the charges for electricity should be reduced, and this has been approved by the Gas and Electricity Committee, and is to be considered by the T.C. shortly. It has been found that about two-thirds of the total number of consumers at present get no rebate. The present charges are on the maximum demand system of 6d. per unit 1½ hours, and 3d. after, and it is now proposed to reduce the time of maximum demand to 1¼ hours with rebates quarterly instead of half-yearly, and also to introduce a flat rate of 5d. with quarterly rebates. Reductions in meter rents are also recommended, from 3s. 6d. to 2s. for 5 amperes, and from 9s. for 300 amperes, in proportion. The mean price to all consumers is at present 5·25d.

Canterbury.—A L.G.B. inquiry was held last week into the application of the T.C. for sanction to a loan of £10,000 for the provision of additional boilers and another generating set at the Electricity Works.

Carlisle.—The T.C. has received from the L.G.B. sanction to borrow £5,000 for mains extensions, meters, services, &c.

The Council has entered into an agreement to light the Canal Goods Yard of the North British Railway Co. by electricity.

Cauvery Falls.—The *Madras Standard* states that on the first year's working of the power scheme laid down at the Falls, the net profits were 31·86 per cent., and it is calculated that in five years the total cost of just over half a million sterling, of both installations, which provide together about 6,500 H.P., will be recouped, and the probable net profit for the first nine years is put at £750,000. Proposals are now under consideration for electric lighting and tramway systems for Mysore and Bangalore, power to be derived from the Falls, and a day is pictured when Malvalli, 12 miles distant, from the source of power, will become a flourishing industrial centre, and aluminium and iron produced by electricity from local ores. In consideration of the services rendered to the State by Major Joly de Lotbiniere in developing the energy of the waterfalls, a proposal to grant him a bonus of Rs. 20,000 is strongly supported.

Cheltenham.—Last week Mr. J. Swinburne, nominated by the President of the I.C.E. at the request of the T.C., to investigate the working of the electricity undertaking, attended at the Town Hall for the purpose of hearing representations from any interested ratepayers.

Complaints were made by the Ratepayers' Association regarding mains extensions, which it was contended, on the capital outlay, were quite unremunerative; £10,000 a year was too much to pay for street lighting; energy was supplied to the traction company

at a loss. Other points of criticism were the absence of a depreciation account; neglect to ask for open tenders for plant, and the policy of allowing the yearly deficits on the undertaking to accumulate instead of writing them off year by year, as the order required. The accumulated deficiency to date was stated to be £17,000. The case for the Electricity Committee is to be heard at a future date.

Darlington.—The T.C. has reduced the price of energy for lighting purposes from 5d. to 4½d. per unit for the first 1,000 units, from 4¾d. to 4½d. per unit for the next 2,000, and from 4½d. to 4d. for over 30,000 units.

Dewsbury.—The Electricity Committee of the Corporation has decided to reduce the price of energy as from October 1st, as follows:—For lighting purposes, from 6d. and 3½d. to 5½d. and 3½d., one hour maximum demand; for power purposes, from 4d. and 1d. to 3d. and 1d., one hour maximum demand. Meter rental up to 50 amperes has been fixed at 7s. per annum, and for all sizes above 50 amperes, 10s. per annum.

Devonport.—Further extensions of plant have been decided upon by the T.C., and the L.G.B. is to be asked for its sanction to the borrowing of £7,958 to carry out the work.

Dover.—The R.D.C. has approved of the Corporation E.L. prov. order covering the rural parishes, including St. Margarets.

Dundee.—Mains extensions, at a cost of £400, have been sanctioned. Application has been made for a supply of energy to a 40-H.P. motor, and as the works are situate within the Harbour boundary, permission is to be obtained to lay the main, the cost of which will be about £70.

Recently the T.C. resolved to do away with the copper strip conductors, and to substitute modern cables. This work will necessitate an expenditure of over £2,000.

Dunfermline.—The T.C. has resolved to consult Mr. W. B. Sayers, of Glasgow, as to whether it should proceed to negotiate with the Fife Electric Power Co., or put down works for itself.

Eltham.—A poll of the parish has been taken by the Ratepayers' Association, regarding the Woolwich B.C. scheme for supplying electricity to the district. It is proposed to inform the B. of T. of the result of the poll, and the B.C. has been asked to receive a deputation on the subject.

Gravesend.—The draft of the proposed agreement to supply electricity to Northfleet is to be considered by a committee of the whole Council.

Hanwell.—The U.D.C. has instructed the Lighting Committee to ascertain what expense would be entailed by engaging an expert to report as to the best method of dealing with the electric lighting order. It was further decided to ask the Ealing Corporation and the Harrow U.D.C. for terms upon which they would be prepared to supply electricity in bulk.

Hastings.—On the 6th ult. the T.C. held a meeting relative to the L.G.B. inquiry into the application to borrow £3,416 for E.L. purposes. The board, after considering the report of its inspector, has informed the Council that it observes that a loss on working had been made for the years 1900—1903, inclusive, and that only during last year was any sum raised by rate toward meeting these deficits; the total deficit carried forward on December last amounted to £4,468. The T.C. has now replied, stating that it has been resolved to set aside a yearly sum of £1,500 appropriated from the General District Rate for the purpose of wiping out this deficit.

Huddersfield.—Application is to be made to the L.G.B. for sanction to borrow £4,300 for the purpose of extending the supply to the Golcar U.D.

Litherland.—The U.D.C. has resolved to apply to the Board of Trade for an electric lighting prov. order.

Liverpool.—Col. A. J. Hepper, D.S.O., was appointed by the L.G.B. to hold an inquiry yesterday into the application of the Corporation for sanction to borrow £400,000 for electric supply purposes.

London.—Lambeth.—The B.C. has instructed the town clerk to have the case against the South London Electric Supply Corporation, Ltd., in respect of alleged breach of contract in failing to take and destroy the dust, as set forth in the agreement between the late Vestry and the Corporation, brought to trial as speedily as possible. It was explained that the delay which had occurred was through the death of Mr. Justice Wright.

Chelsea.—Upon a report of the quantity surveyor for the rebuilding of the baths and the town hall extension, the Committee in charge has recommended that electric light be installed, at an estimated cost of £2,600. It is calculated that to light the new buildings with gas would cost £350 per annum, and by electricity from the Supply Co., £650, but that if an E.L. installation was put down, the cost need not exceed, after a period of 10 years for repayment of loan, £226 per annum.

Kensington.—Permission has been given by the B.C. for mains extensions by the Notting Hill Electric Lighting Co., in Ladbroke Grove, Clydesdale Road, and Westbourne Grove, and by the Brompton and Kensington Electrical Supply Co., in Warwick Street.

St. Pancras.—In consequence of the decision in the case of Colwell and Others *v.* The Borough Council, further leasehold premises are about to be acquired for £500. The occupier complained of continual vibration from the electricity works.

Holloway.—In order to obviate the possibilities of suicide by gas, the electric light has been installed in 400 cells in Holloway Gaol.

Fulham.—The Lighting Committee of the B.C. reported on Monday, having approved of the following statement submitted by the electrical engineer as to the disposal of the £52,042 voted for extensions and estimated costs:—Generator switchboard, £500, tenders have been invited; 1,000-kw. Belliss set, £8,947, estimated date of completion, July, 1905; chimney, £4,000; boiler house, buildings, and alteration, including new rectifier room (part ordered), £7,500; coal bunkers, elevators, &c., £2,230; four boilers and accessories (portion already ordered), £4,340; feed pumps, £250; condenser, sump, and river work, £2,000; wiring motors, £200; exciter set, £500; pipes (portion already ordered), £3,000; economisers, £1,075; turbo-alternator (ordered), estimated cost £7,000; extra buildings, £4,000; connections, £6,000; contingencies, £500.

Marylebone.—It being at present inconvenient to issue stock for the amount of the loan to the B.C., the L.C.C. has determined to raise the money temporarily by the issue of London County bills with a short currency. The total amount of cash to be received by the L.C.C. is £1,415,294. This will be immediately advanced to the borough council, the latter paying as interest the actual cost to the County Council of raising the loan. The loan is to be repaid within a period of 38 years, and the bills will be replaced by the issue of stock so soon as the financial conditions are sufficiently favourable.

Manchester.—The Electricity Committee is considering a report of the chief engineer (Mr. Pearce) on the results of experiments, recently made in electrically lighting certain parts of the city. The details of the report have not been disclosed, but it is understood that the Committee are satisfied with the results which have been obtained. All the old types of lamp have been exchanged for the Gilbert enclosed type.

Neath.—A L.G.B. inquiry was held recently into the application of the R.D.C. for sanction to borrow £20,000 for E.L. purposes.

Ormskirk.—The T.C. has decided to petition the L.G.B. to refuse sanction to the Board of Guardians borrowing money for an electric lighting scheme.

South America.—The electric lighting installation at Gualquay has been inaugurated.

Mr. T. B. Holway, on behalf of a syndicate, has applied to the Buenos Ayres Municipality offering to put down a municipal electricity works. The capital would be $18,000,000 gold, and the tariffs to be charged would be such as to allow an interest of 5½ per cent. and 1 per cent. to sinking fund.

South Perth (Western Australia).—For the past two years negotiations have been proceeding between the Municipal Council and various parties for the establishment of a public supply of electrical energy in the district. Finality was reached on September 12th, when the Council signed an agreement granting a 21 years' concession to Messrs. J. Barre, Johnston & Co., of Perth. The first installment of the plant has to be erected in running order in eight months from the date mentioned, and will comprise Babcock & Wilcox boilers, steam dynamos, balancer, and switchboard, sufficient for about 1,750 8-C.P. lamps, supplied on the continuous current three-wire system, at 460 volts between the outers. The streets will be lit by 150 incandescent lamps, supported by brackets attached to Jarrah poles, carrying the overhead mains; the charge to consumers will be 10d. per unit for lighting, and 8d. for power on a sliding scale with discounts.

Wexford.—From an Irish paper we gather that a scheme is on foot for lighting the town by electricity, and that a company, with a capital of about £20,000, is to be formed.

Whitehaven.—The T.C. has extended the lighting mains to Kells, at a cost of £240.

Whitwell. — The County Council has sanctioned the borrowing of £2,000 by the P.C. to carry out its proposed lighting scheme.

Woolwich.—The Electricity Committee of the B.C., in response to appeals both for and against extending the electric light to Eltham, has taken back the scheme for reconsideration. The Council has, on reports submitted by the town clerk and electrical engineer, decided that, in the interest of economical working of the three electric light undertakings in the borough, they should be amalgamated into one, and to obtain a prov. order for the whole of the borough.

TRAMWAY AND RAILWAY NOTES.

Australia.—An electric tramway undertaking is now being carried out at Ballarat on similar lines to a scheme laid down at Bendigo. The contractors for the work are the Electric Supply Co., of Victoria. The foundation stone of the power house was laid early last month.

Bournemouth.—The arbitration proceedings regarding the price to be paid by the Bournemouth Corporation for the undertaking of the Poole and District Electric Traction Co., Ltd., were resumed at the Surveyors' Institute, Westminster, on Thursday last week. The umpire is Mr. A. T. Lawrence, K.C. (who, since the last sitting in June, has been appointed Judge of the High Court), and the arbitrators are Mr. Robert Vigors and Mr. R. Eve. The claim of the company amounts to £427,619, while the valuations on behalf of the Corporation vary between £55,000 and £67,000. The case for the Corporation was concluded by the calling of Mr. J. B. Hamilton, general manager of the Leeds tramways, and Mr. Ryde, of the Westminster firm of valuers, both of whom placed the number of years' purchase of the undertaking at 16¾. Mr. Honoratus Lloyd, K.C., for the Corporation, addressed the Court, and argued that from the company's own figures their working expenses were much higher than their valuers had calculated, and therefore the figure of net profits on which the company had estimated should be greatly reduced. The proceedings were adjourned till the next day, when, in the course of his address on behalf of the Corporation, Mr. Honoratus Lloyd, K.C., said his clients regarded the claim of the company as grossly exaggerated and extravagant, and put forward without due appreciation of the tribunal before which they were going in the hope of arriving at some such wretched result as "splitting the difference." Mr. Balfour Browne, K.C., for the company, contended that the proposed extensions were *bonâ fide*, and the Corporation ought to pay full compensation for them. The tribunal had simply to decide in regard to the existing line what was the value in the open market of an income of £5,622 for nine months. That was the sum shown as profit on the 1901 balance sheet of the company, which the Corporation had agreed to take as a basis. The balance sheet had to be taken as it stood, and the Corporation could not introduce any sum for depreciation.

Blyth.—A suggestion has been made at Blyth, Northumberland, and is finding much acceptance there, that an endeavour should be made to induce the Tynemouth and District Tramway Co. to continue their line northward to the Port of Blyth. The latter place is between six and seven miles north of Whitley, where, at present, the Tynemouth line terminates. It would, undoubtedly, be a convenience to people wishing to travel from Blyth to the Tyne, as the train service is far from being one of the best, but as the line would only directly tap one small place on the way—Seaton Sluice, a place whose glory is all a matter of history—the probability of the suggestion being carried out may be doubted for financial reasons.

Brighton.—The Tramways Committee has decided to install one of Turner's automatic points as an experiment. A proposal was submitted to the Committee that half the cars should go to the railway station, as a terminus, instead of going to the Old Steine, but it was decided that the suggestion was impracticable.

Caucasia.—Good progress is being made with the conversion of the tramways in the town of Tiflis to electric traction. Three-quarters of the work has been completed, and it is hoped to have the lines in operation early next year.

Croydon.—The T.C. has decided to object to the application of the B.E.T. Co. for an extension of three years in which to complete the tramways authorised by the Mitcham Order of 1901.

Darlington.—The T.C. has decided to deduct £450 from the account of the British Electric Equipment Co., and £392 from the account of the British Westinghouse Co., Ltd., as damages for non-completion of contracts in connection with the tramways.

Derby.—We mentioned last week that the question of delay in execution of works between the Derby Corporation and Messrs. J. G. White & Co., Ltd., had been amicably settled. We are now given to understand that the work actually carried out was largely in excess of the contract requirements, and involved numerous changes in the specifications. This naturally caused the time originally specified for completion to be exceeded.

France.—Work is about to be commenced on the construction of an electric railway between Villefranche and Bourg-Madame (Western Pyrenees).

Halifax.—On the 14th inst. a collision took place at Halifax between two electric single-decker cars. Owing to the brakes of one of the cars failing to act, it dashed down a steep hill, and, near the bottom, ran into the other car, both being turned off the rails. The front of each car was completely wrecked. The driver of the runaway car was injured, and the driver of a wagon, belonging to the Corporation, which was overturned in the accident, had to be removed to the infirmary.

The double track section of the Corporation route from Brighouse to Bailiff Bridge was officially inspected by the B. of T. on 13th inst., and this section was to be opened for traffic last Tuesday.

Italy.—A company has just been formed in Brussels with a capital of £52,000, to be known as La Société du Tramway Electrique de Rome à Civita-Castellana.

Keighley.—The B. of T. inspection and the formal opening of Keighley's new system of municipal trams took place on 12th inst. Permission was given to open the public service pending the arrival of the official authorisation. Later in the afternoon the Mayor started the first car from the shed. A 10 minutes' service from each of the termini at Utley and Ingrow is being established, and a more frequent service to and from the railway station. There are 2 miles 47 chains of double track, and 26 chains of single track. Borrowing powers for £42,000 have been obtained to complete the extension from Victoria Park to Screwmill Lane End.

Leeds.—The tramway accounts for the half-year ended September 29th, show a net profit of £39,293. The receipts reached £161,089, compared with £151,367 in the corresponding period of last year, an increase of £9,721, which is set down to the more favourable weather and to the introduction of the "split turn" system. The total cost of working was £83,500, against £80,635 in the corresponding period of last year. The net profit indicated, £39,293, is after deducting expenses for depreciation, interest and sinking fund, and compares with £36,890 in the corresponding period of last year. There has been an addition of 500,000 car-miles in the past year.

Liverpool—Southport Electric Railway.—A correspondent writes that the electric cars are now running more smoothly than hitherto, and on the 14th inst. a commencement was made with the lengthening of the trains by putting on five, instead of four, electric coaches. A sign of the progress of the line and the intention of the Lancashire and Yorkshire Railway Co. to cater for the public, is the fact that they intend to construct a new station half way between Marsh Lane and Seaforth Stations, while a new station also is contemplated between Birkdale and Ainsdale, where a new district is becoming populated, as a result of the accelerated and electrified service. In order that passengers using the line hereabouts may be safeguarded, the company have had erected at Freshfield Station a footbridge, and have issued a warning that passengers must not cross the line except by the bridge, yet, says our correspondent, "the travelling public seems slow in appreciating the warning."

London.—L.C.C.—The *Daily Chronicle* says that Mr. J. Allen Baker, Chairman of the Highways Committee of the L.C.C., has just returned to London after a tour through the United States, during the course of which he has made a study of the developments of street transit in that country. The results of his investigations will be embodied in a report which he has been asked to present to the Highways Committee of the Council.

St. Pancras.—The L.C.C. has written to the B.C. on the subject of its requirement that a uniform system of electric conduit tramways should be adopted throughout the borough. It is estimated that by the substitution of the conduit system on those routes for which it is suggested that the overhead system should be employed, the additional outlay would amount to something like £500,000. A special Committee of the St. Pancras Council recommends the latter to adhere to its resolution requiring the adoption of the conduit system throughout.

Londonderry.—The Privy Council has approved of an electric tramway system being put down between Derry and Moville.

Manchester.—A collision occurred between two Corporation cars at the junction of Besswick and Mitchell Streets on 15th inst. One of the drivers was severely cut by the glass and badly bruised, necessitating his being taken to the hospital; two passengers were also similarly hurt. Traffic was delayed for about an hour on this section.

A report was submitted recently to the Tramways Committee by the special sub-committee *re* parcels. It was recommended that the old depôt in Stockport Road, Longsight, be utilised as a parcel depôt, and that the necessary alterations of the premises be carried out, and that the mess-room for the men in George Street be transformed into a receiving office. The sub-committee was authorised to make all arrangements for bringing the parcels department into operation as soon as possible, including the provision of all the necessary plant and staff.

Manchester and Altrincham.—The construction of the lines from Stretford to Altrincham, completing the connection of the latter town with Manchester, is being delayed, owing to a difficulty with regard to bridges over the Mersey. One of these needs widening and strengthening, and the cost of the work will probably fall upon the County Councils of Lancashire and Cheshire, and the Manchester Corporation, but the liability has yet to be fixed. It is hoped that the difficulty will soon be removed, in view of the strong local demand for the construction of the lines. The project includes a tramway service for the populous Urban District of Sale, but it is understood that the connection with Gatley (the terminus of the Stockport tramway system) by way of Northenden, will not be proceeded with, at any rate until the Altrincham section is completed.

New York City.—The Long Island Railroad Co. has commenced work on the construction of a four-track line from Long Island City to Mineola. The trains on this line are to be operated by electricity in the spring of 1905.

Southport.—The pier tramroad is shortly to be operated by electricity at a cost of about £700, the Pier Co. defraying the cost by instalments.

West of Fife.—A conference is to be arranged between representatives of Dunfermline T.C., Dunfermline District Committee, and the burghs of Inverkeithing, Cowdenbeath, and Lochgelly, in regard to the proposed scheme of tramways for Dunfermline and the West of Fife, and as to how the streets and roads will be affected thereby.

Rossendale.—The Bury Corporation is being urged by the Ramsbottom District Council to arrange for a continuation of the Tottington section of the Bury tramways, through Greenmount and Holcombe to Ramsbottom, in the direction of the Rossendale Valley. An extension is desired to Walmersley, connecting with another Bury route to Limefield. An interview took place between representatives of the local authorities a few days ago, but no definite decision was arrived at.

Trichinopoly.—About three years ago a proposal was made to the District Local Board to run an electric tramway from the Junction Station through the town to Srirangam Island, and to provide at the same time an installation of electric lighting and power for the town. The population of Trichinopoly is 100,000, and that of Srirangam 25,000. The island contains two sacred temples, and the concourse of pilgrims from all parts to these is great, and it was anticipated (according to the *Madras Times*) that the traffic on a tramway, if laid down, would be large. Only one route between these two towns was open, that of the Cauvery Bridge, which is about a quarter of a mile long. The D.L.B. decided that the proposed scheme would be of benefit to the populace, and in 1903 granted to the proposer a term of one year within which to put forward a workable scheme, with certain conditions. An estimate for the proposed work was submitted, providing a tramway, light and power scheme at a cost of £50,000, and promising a return of about 10 per cent., or if the Board preferred to carry on the work itself, the capital could be found in London at 5 per cent. without commission. At the last moment the D.P.W. authorities stated that the Cauvery Bridge would not support a tramway. The bridge was constructed about 70 years ago, and is the only one across the river for a distance of about 110 miles. It is now urged that this should be substantially repaired and the scheme carried out.

Urmston.—The L.G.B. has sanctioned the borrowing powers asked for by the Urmston District Council to cover its share of promoting the Manchester Southern Tramways Act. The construction of the lines in Urmston is subject to an arrangement with the Manchester Corporation, who will become the lessees. Urmston is a comparatively new and rapidly-growing suburb of Manchester.

TELEGRAPH AND TELEPHONE NOTES.

Brighton Telephones.—The Telephone Committee, in response to numerous requests, has brought forward a draft balance-sheet and report for the half-year ending September 30th, 1904. The report states that on October 5th there were 1,448 exchange lines, and in addition 21 junction lines in use. On an average 4,564 conversations are made daily except Sundays; there are 27 public call offices, all of which are paying satisfactorily. Sub-exchanges are working at Burgess Hill with 57 lines, Portslade with 33, and the Shoreham exchange has only just been opened. Exchanges at Hurstpierpoint and Steyning are in course of construction, and will be opened shortly. The addition to the switchboard at the Central Exchange has been completed, and the whole board now has a capacity for 2,088 subscribers, and 48 junctions. It provides switchboard accommodation for more than 2,090 subscribers, and there are in use and on order 2,000 instruments. Cables are laid to supply more than 2,500 subscribers. The financial position of the undertaking is also claimed to be satisfactory. It is said that the next 500 subscribers can be connected at a very small cost for labour, and practically these rentals will be all profit, as the working expenses and capital charges will be very little increased. After charging working expenses, interest, and sinking fund of the £42,000 loan already taken up, an approximate revenue account for the half-year shows a profit of £98 7s. 7d., after allowing £30 for bad debts. The annual revenue of the department at the present time is £6,411 7s. 8d., the amount having increased during the past six months at the rate of £411 per month. The Telephone Committee decided to charge canvassers' salaries to capital account when obtaining new subscribers during the first year.

Bournemouth Telephones.—There is nothing approaching to unanimity among the Bournemouth Town Councillors on the question of applying for a telephone licence, under which a municipal telephone scheme would be carried out upon the lines of the recommendations and estimates submitted by Mr. A. R. Bennett. The Council some days ago had a discussion on the subject. The voting on an amendment to drop the subject was 13 for and 17 against, so that the recommendation for municipal telephony has passed by the very substantial majority of four votes. We do not wonder that the Mayor felt called upon to observe that he did not think they would get a licence on a vote of 17; it was not half of the Council.

The Postmaster-General and the Brentford District Council.—At Brentford County Court on 14th inst. his Honour Judge Shortt, K.C., sitting as arbitrator under Sec. 3 of the Post Office Act, 1878, gave judgement in the dispute between the Postmaster-General and the Brentford District Council as to overhead or underground wires. The *Morning Advertiser* says that to meet the demands of subscribers in Brentford to the Post Office telephone system, the Postmaster-General proposed to run lines along the Ealing and Hanwell Roads at Brentford, but the local Council refused to assent to overhead wires. In order to meet the demand for a cheap telephone system, it was incumbent on the postal department to make the installation as cheap as possible, but this could not be done if the demands of the local Council that wires should be laid underground were insisted on. The roads in question were unfrequented and suitable for overhead wires, and the cost of installation would be £47 5s. 5d., whereas to lay the lines underground would cost £364 5s. 6d. The difference was so great that the Postmaster-General would be forced to give up the project as an unprofitable one if underground wires were insisted on. He had, however, offered to lay them beneath the surface if the Brentford Council would bear the cost of opening and closing the trenches.

For the respondents (the Brentford Council) it was urged that they had no authority under any Act to bear the expense of telephone laying, though Ealing, being a borough, could do so. There was no need for the new service, as Brentford was well supplied by the National Telephone Co.; the roads named were narrow and unsuitable for overhead wires; and, further, it was incumbent on the Postmaster-General to satisfy the needs of the local authority.

His Honour said that having visited the roads along which it was proposed to lay the service, he was satisfied by their narrowness that they were unfit to have poles set up in them, and having examined the spots at which the poles were to be erected, he was of opinion that they would interfere with the enjoyment of the householders' rights and seriously incommode the general traffic on the pavement. The expense of putting the wires underground was not sufficient to outweigh this view, and he found for the respondents. Having regard to the existing telephone system in Brentford, he was not satisfied that there was any pressing need for the new wires, but, anyway, they must be underground.

Imports of Telegraph Cables.—There was last month a much larger importation of foreign telegraph cables and apparatus connected therewith into this country than usual, the returns now available showing a total of £9,370, which contrasts with only £2,668 in September, 1903. Notwithstanding this, however, the imports this year, to date, show a decline, having amounted during the nine months ending with September, to only £33,036, as compared with £44,780 in the corresponding nine months of last year.

Wireless Telegraphy.—We read, in *Indian Engineering*, that the Telegraph Department will resume its attempt to establish wireless telegraphy with Port Blair on November 1st.

Telegraphic Interruptions and Repairs :—

Cables.	Interrupted.	Repaired.
Trinidad-Demerara (No. 1)	Aug. 26, 1901	
Trinidad-Demerara (No. 2)	Oct. 10, 1904	
Dominica-Martinique	May 7, 1902	
St. Lucia-Martinique	May 7, 1902	
Cayenne-Pinheiro	Aug. 13, 1902	
Reissa-Issa (Yemen)-Camaran	Oct. 22, 1902	
Tarifa-Tangier	Jan. 18, 1904	
Closed Vladivostock-Nagasaki	Feb. 9, 1904	
Closed Port Arthur-Chefu	Mar. 9, 1904	
Paramaribo-Cayenne	July 13, 1904	
Cape Haitien-Mole St. Nicholas	Aug. 20, 1904	
Bundaberg-Gomen (New Caledonia)	Aug. 30, 1904	
Brass-Bonny	Oct. 10, 1904	Oct. 13, 1904
Cape Town-Swakopmund	Oct. 10, 1904	Oct. 13, 1904
Swakopmund-Mossamedes (under repair)	Oct. 10, 1904	
Bolama-Bissao	Oct. 13, 1904	
Landlines.		
Cartagena-Baranquilla	Dec. 8, 1900	
Puerto Bairros	July 28, 1902	
Seoul-Gensan	Feb. 18, 1904	
Seoul-Masampo	Feb. 18, 1904	
Anju-Ping-Yang	Feb. 25, 1904	
Ninguta-Vladivostock	March 2, 1904	
Caimanera-Santiago	June 15, 1904	
Kertch-Soutehoum	Sept. 27, 1904	
via Bhamo beyond Tingyuoh	Oct. 15, 1904	

Toronto Telephones.—From the *Toronto Star*, of October 3rd, we observe that Mr. A. R. Bennett has been offering some criticisms of certain specifications which have been prepared by the city for the establishment of an independent telephone system in Toronto. The criticisms are quoted from a private letter to a Toronto gentleman. He says that the terms are so disappointing, that capitalists in this country will not consider them for a moment, and he holds that they were drafted without a proper appreciation of the circumstances. He adds :—

"A company required to compete with an established rival for the good of the citizens of Toronto requires to be encouraged, not treated as a thief or burglar. To secure economical extension, a company would have to provide, in the first instance, for very many more lines than it could join up for two or three years. The capital expended on this spare plant would be idle for a long time, and prevent dividends being reached for a considerable period after starting.

"The Corporation ought to guarantee 4 per cent. interest on the amount of this unremunerative capital until such time as it is brought into use.

"I do not suppose that any *bonâ fide* tenders will be received; if such come to hand they will be from promoters of companies seeking an opportunity to make a profit out of floating a company, which would then be left to struggle with an impossible task; or possibly from persons not understanding the telephone business sufficiently to appreciate the consequences.

"I could, I am persuaded, finance a company to work Toronto on decent terms. Possibly I may write the Mayor to that effect."

In his opinion the company would be placed "too much at the mercy of officials and arbitrators; the 10-year term is too short; the terms of extension and of acquirement of the system by the Corporation are inequitable; the company cannot make sure of even getting its capital stock back under the proposed arrangement."

Mr. Bennett's remarks here quoted respecting spares are interesting. His attitude in regard to this matter in the case of Tunbridge Wells and Glasgow is already familiar to our readers.

FITTINGS AND APPLIANCES FOR ELECTRIC LIGHTING, HEATING, AND COOKING.

Wooden Electric Fittings.

It is always a pleasure to place on record new developments in any branch of electrical activity; and that the "Works" of Messrs. J. S. Henry, Ltd., of 287, 289 and 291, Old Street, E.C., deserve to be included in this category cannot be disputed. Departing altogether from conventional and accustomed lines, Messrs. Henry have found in the use of wood for electric lighting fittings a hitherto unexplored field for the exercise of their artistic talents, and have made good use of their discovery, as the accompanying illustrations will demonstrate.

Fig. 1. shows a wall bracket made of wood, the wall-plate of which is inlaid with green and white.

Fig. 2 represents a ceiling fitting to carry four lamps, finished with oxidised silver and enamels. A corner lantern, with leaded panes of obscured glass, is illustrated in fig. 3, and fig. 4 shows a simple pendant for four lamps, which are kept in place by a wooden ring. A table lamp, provided with a silk shade lined with white, is shown in fig. 5, and fig. 6 is another pendant, with leaded coloured glass and oxidised chains, carrying four lamps. These are but a few of the large variety of designs already evolved by Messrs. Henry, who are to be congratulated upon their enterprise and the

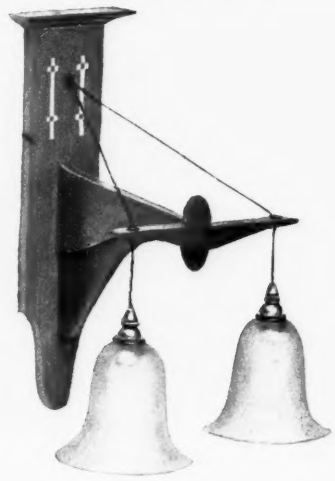


Fig. 1.—Wall Bracket.

Fig. 2.—Ceiling Fitting.

Fig. 3.—Corner Lantern.

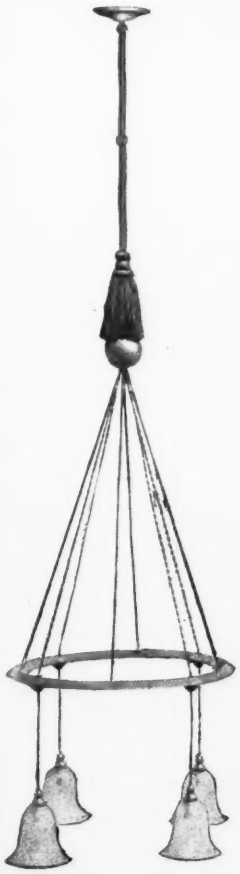


Fig. 4.—Simple Pendant.

Fig. 5.—Table Lamp.

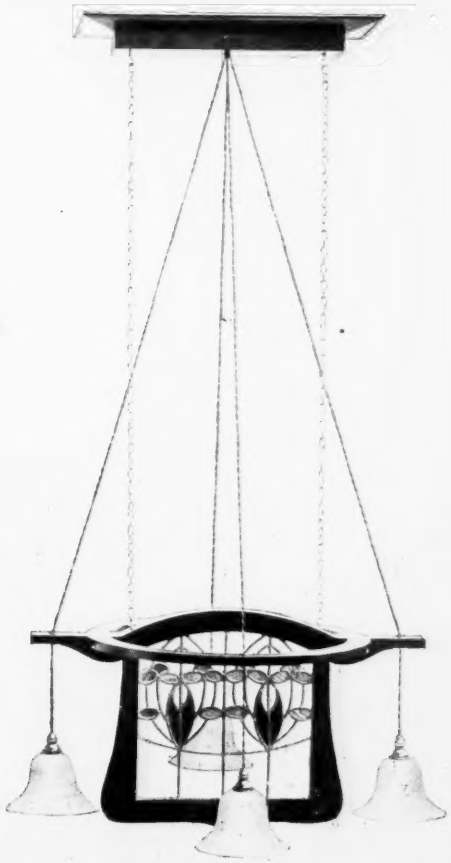


Fig. 6.—4-lamp Pendant.

thoroughness with which they have carried out their task. There is no risk to be feared from the use of wood in fittings, and the insurance companies, we learn, have passed them as satisfactory. A tasteful set of catalogues has been issued, showing a large number of fittings. Special designs are also made in any style desired.

Thursfield's Electric Fittings.

Messrs. C. J. Thursfield & Co., of Cecil Works, Clement Street Parade, Birmingham, are at the present time bringing out an entirely new range of fittings for the 1905 season, most of them registered designs. Two of these registered designs are shown in the accompanying figures. No. 5,084 (fig. 1) is a high class electrolier in hand-wrought work of a unique and pleasing design; and No. 5,087 (fig. 2) shows a high class lantern suitable for a porch or hall—it is hand-wrought work and has leaded panels. A new line of brackets in fine cast work is also figuring among Messrs. Thursfield's current designs.

Fig. 1.—Thursfield's Registered Design.

Veritys' Fittings and Arc Lamps.

Messrs. Veritys, Ltd., of King Street, Covent Garden, W.C., are just issuing to the trade a very fine new catalogue for 1905. We have before us departments 1 and 2, the former dealing with electrical machinery, and the latter with electrical supplies in general. A good index, and the Aston telegraphic code, which has been specially compiled for use with the present catalogue, also quantity and other useful tables, pave the way for matter relating to (*a*) electrical plant; (*b*) machinery; (*c*) electrical controllers including switchboards, instruments and starters; (*d*) open and enclosed arc lamps; (*e*) accessories; (*f*) general supplies; (*g*) heating and cooking; and (*h*) bells and telephones. Space will not permit us to refer in any detail to the enormous quantity of descriptive material that has been so ably brought together in this work, which abounds in well-executed illustrations of plant and accessories covering a very wide field, but we believe that all who have to do with the specifying or purchase of these things will find the volume—it is substantially bound—very useful, and one which it is necessary to keep ready to hand.

In this issue we ought, perhaps, to make special mention of the firm's arc lamps and electric light fittings. Of the former we illustrate their new "Aston" enclosed type lamp made under "Worsley" patents. These lamps, which are manufactured throughout at Messrs. Veritys' factories at Aston, are made to gauge and templet, thus ensuring accuracy in every detail. The crown of the lamp is cast solid, and is very strong. The cylinder and reflector, or corona, are painted French grey. The globes are of special heat-resisting glass. The lamps are said to be light in weight, and of small dimensions, and while rigidity and strength are claimed as special features, we understand that they are also capable of withstanding considerable excess currents. The single enclosure lamp is shown in fig. 1. The Aston enclosed lamps are supplied series wound for running in single parallel, or differentially wound for either parallel or series burning. The differential lamps are finished in three different types, according to the provision or otherwise of a self-contained line resistance, cut-out, and substitutional resistance. The lamps carried in stock by Messrs. Veritys are arranged for taking a current of 4 to 6 amperes on a 110-volt circuit, or a multiple of 100 volts, with a mean pressure of about 80 volts per lamp at the arc.

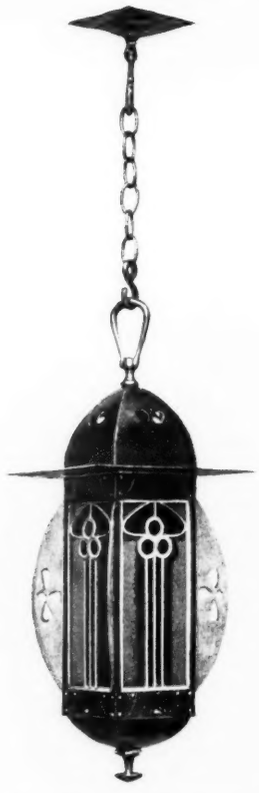


Fig. 2.—Thursfield's Registered Design.

Fig. 1.—The Aston "Worsley" Arc Lamp.

Fig. 2.—A Verity Bracket.

The firm's "Department 3" catalogue is on the point of issue; it is devoted especially to electric light fittings, and will include a very good collection of designs of high-class fittings and silk and glass

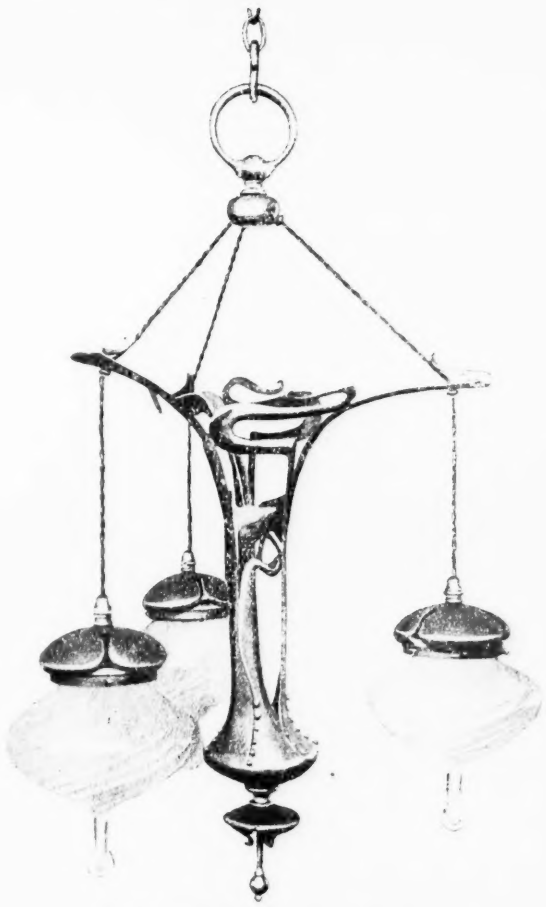


Fig. 3.—A Verity 3-Light Electrolier.

shades therefor, as well as cheaper classes of fittings; also for indoor, outdoor, shop and ship lighting. Some smaller publications which Messrs. Veritys have in circulation already contain some very

Fig. 4. Fig. 5.

Verity Bracket and Hall Lantern.

acceptable styles and designs, and from these we have made a few selections for the purposes of illustration. Fig. 3 is a quaint hand-wrought electrolier for three lights, which strikes us as particularly good among the fittings of this class. Fig. 4 shows a hand-hammered bracket, and fig. 5 is a taking quaint hand-hammered lantern, with opalescent cylinder. Fig. 2 (p. 654) is another very neat specimen in bracket fittings.

For the benefit of the trade, Messrs. Veritys have prepared some special hand show lists, from which the front page with name may be easily removed, if desired.

Electric Lamp Shades.

Messrs. Louis Dernier & Co., of 78, Newman Street, Oxford Street, W., who are specialists in the design and manufacture of artistic lamp shades for all methods of illumination, have some

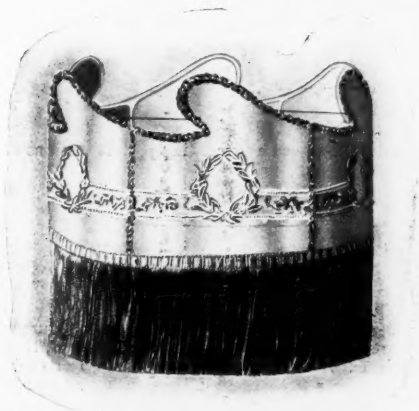


Fig. 1.

exceedingly neat selections of shades for electric candle-fittings, pendants, electroliers, and so forth. Everyone recognises what an important part effective and artistic shading has to play in the production of satisfactory illumination, especially in drawing and dining rooms. The more excellent the work of the designer and

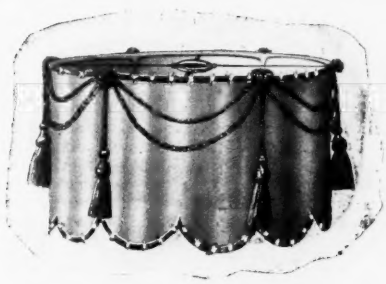


Fig. 2.

maker of shades, the better must it be for electric lighting We illustrate a few of the latest and most attractive of these designs, chosen from a very large collection shown in Messrs. Dernier's beautifully illustrated catalogue. In figs. 1 and 2 are two specimens of silk pendant shades, which are designed to

Fig. 3.

Fig 4.

allow the light to be reflected from the ceiling, thus considerably increasing the illuminating effect; fig. 1 is in sarsnet, lined in white and trimmed with a fancy embroidery and silk fringe, while fig. 2,

in imilar style, has silk cord trimming and tassels. Fig. 3 is a handy and new tilting shade arrangement for table standards, and

Fig. 5.

Fig. 6

figs. 4, 5 and 6, show some exceedingly neat designs for small pendants.

Magnetic Gate Lock.

The magnetic safety gate lock (patent), manufactured by The Auto-Controller and Switch Co., of Vienna Road, Bermondsey, is intended primarily for use in passenger lifts. In its construction a pivoted stop is normally pressed by a spring into a notch in the latch, and prevents the latter being raised even if a knife or other implement be used in the attempt. The stop is withdrawn from the latch by a small electro-magnet, which, on a push in the cage being pressed, is energised by one or more dry cells. A concealed or locked push is provided exterior to the cage, for operating in the event of the gates being closed when the cage is unoccupied.

The lock is also provided with a device for preventing the lift being started while any gate remains open. This consists of a spring-pressed bridge-piece, which, when the gate is closed, is pressed, by a suitable projection on the jamb, into contact with two terminals in the main circuit of the motor. When the gate is open, this circuit is broken, and it is, in consequence, impossible to start the motor. It will be seen that, with this lock, the risk of accident is reduced to a minimum.

Another speciality manufactured by the Auto-Controller and Switch Co. consists of a simple and comparatively inexpensive hand switch for electric cranes and similar machines. This switch comprises two disks of insulating material, secured to a vertical spindle, the latter being provided with a suitable handle. The resistances are carried between the two disks, and are connected to contacts thereon. These contacts, as the spindle is rotated, are brought successively into engagement with other contacts in the armature circuit of the motor. The reversing switch is operated by a cam at the lower end of the vertical spindle, and the whole is enclosed in a sheet-iron case.

Some London Electrical Fittings.

The London Electrical Fittings Co., Ltd., of Roberts Works, Hampstead Road, N.W., with whose work our readers are already familiar, have, during the past year, been very busy developing new designs, the special feature of which is a modernised form of the various old English periods, and a choice selection of these can be seen at their fine showroom at 7A, Soho Square. We show in fig. 1 a charming corona in the Adam style, with Wedgwood placques inserted in the band, and fitted up on the outside with the new Huntalite candles. In fig. 2 (p. 657) is seen another Adam pendant in the form of a perfect 6-in. ball of cut glass, which has a very delicate effect. Fig. 3 is a very original and substantially made hall lantern on Jacobean lines, with most effective glass panelling. In fig. 4 is shown their latest design of lantern in the Chippendale form. The radiators shown in figs. 5 and 6 are their newest patterns in this direction; the London Electrical Fittings Co. were, by the way, early at work in the electric heating direction, a branch of the trade in which there is increasing activity.

The firm, who are doing a largely increased business in accessories, have also just put on the market an improved form of single-pole oblong cut-out, as shown in fig. 7, of which they are the sole makers. This was designed by Mr. S. K. Thompson, of Messrs. Edmundson's Electricity Corporation, to meet the most stringent requirements of supply and insurance companies' rules. It has a full break of 2½ in., and there is no metal work between the terminals, as is so usual in this type of article. The cover is held in place by a ring, which screws on to a stout porcelain peg projecting through it, and at the top of this, a hole is provided for the purpose of sealing up the cut-out. It is made in four sizes, 5, 10, 20 and 30 amperes, and is arranged so that either back or front connections can be used; the two larger sizes are fitted with sweating sockets, the smaller with block terminals. The brass work throughout is massive, and the construction substantial. It is a distinct improvement, and among

Fig. 1.—Corona with Huntalite Candles.

consulting engineers and contractors should meet with the same success as the company's "Ajax" wall plug.

Crystal Electroliers, Brackets, &c.

To many it may have seemed most unlikely that there would be any return to the old-style crystal chandelier, at any rate so far as electric fittings are concerned. It is true that lighting fittings with

Fig. 1.

Fig. 2.

Falk, Stadelmann Crystal Fittings.

crystal decorations have never been wholly absent from market designs, but no doubt this is due to the fact that certain popular forms of decoration—particularly of the drawing-room—demand

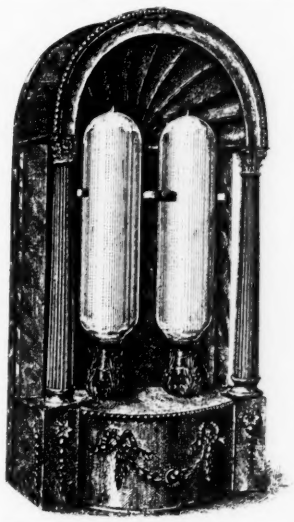


Fig. 5.—New Pattern Radiator.

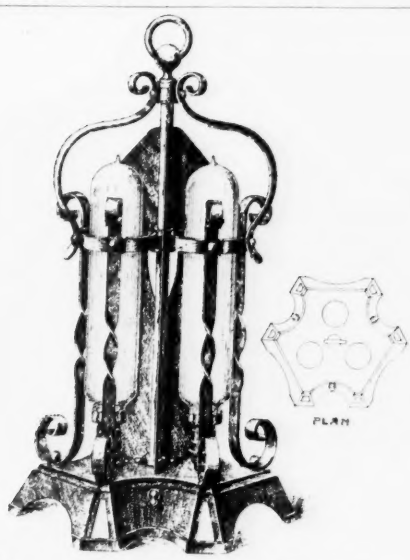


Fig. 6.—New Pattern Radiator

Fig. 3.—Hall Lantern.

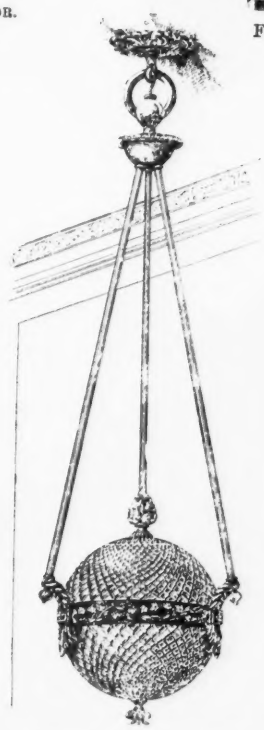


Fig. 2.—Pendant Cut-glass Ball Fitting.

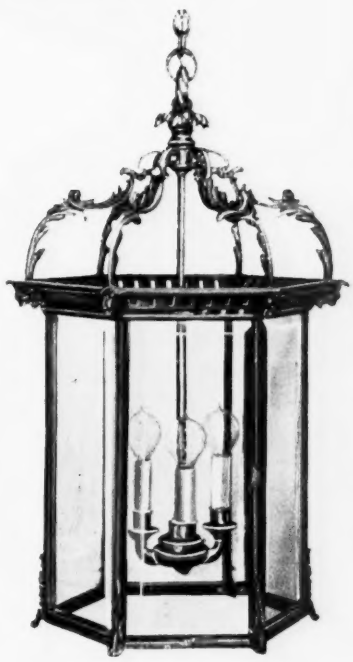


Fig. 4.—Hall Lantern.

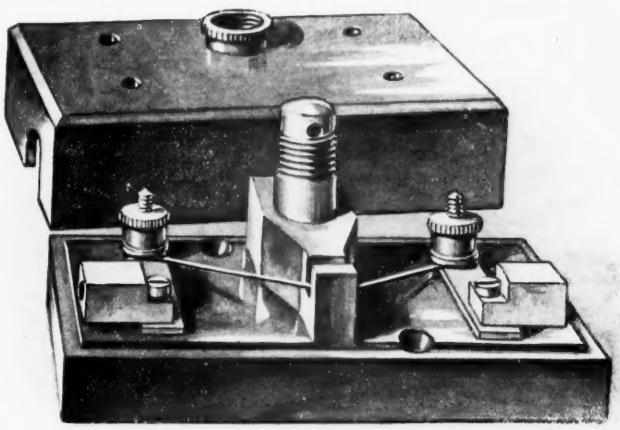


Fig. 7.—Single-pole Oblong Cut-out.

SOME LONDON ELECTRICAL FITTINGS.

such. Hitherto a series of fittings of the style in question was obtainable only by the few, and was not within reach of the man of moderate purse. Messrs. Falk, Stadelmann & Co., Ltd., however, have now placed on the market a series of fittings with handsome cut crystal decorations, elegant in style and moderate in price; the range of fittings includes ceiling fixtures, hall lamps, pendants and electroliers, two or three of which we illustrate. Fig. 1 (see p. 657) is an example of a bracket with crystal mounts and satined flame glass; Fig. 2 shows a handsome four-light ceiling fixture in cast brass, finely chased, of 14 in. diameter, with a richly cut crystal

Fig. 3.

Fig. 4.

Crystal Pendant and Standard.

bowl and knobs. In fig. 4 we show a good example of a newel light, for four lamps, or table standard; the brass work is richly chased and finished ormolu, and the centre carries a massive cut bowl for 1-light, while the three side arms represent torches, and are mounted with torch flame glasses. This piece is well suited for side table or staircase decoration. The remaining illustration in this class, fig. 3, shows a 1-light pendant with ormolu finished mountings and cut crystal decorations.

At their recently-enlarged showrooms in Farringdon Road, E.C., Messrs. Falk, Stadelmann & Co., show many beautiful examples of fittings in the Art Nouveau, the Empire or Classic, and in what

Fig. 5.—Bronze Bell-Push Plate.

might be termed the Eccentric school. In the latter series some quaint designs in table standards, &c., are shown; this group is mostly in real bronze of antique finish, and the subjects are generally serpents, griffins, owls, and other more or less known, real and imaginary members of the lower kingdom. The decoration of these pieces is invariably with jewelled glass—which is at present much in use on the Continent—and some fine effects are obtained.

It has been a source of trouble to the architect, the consulting engineer, and the client as well, that so little variety in bell and switch-covers was offered, and when a limited variety was obtainable, it was generally of such a style, but particularly of such a price, as compelled the client to return to an admiration of the hackneyed fluted cover of the 5-ampere switch, or the reeded pattern stamping of the bell-push, as the case might be. Messrs. Falk, Stadelmann, amongst their large group of accessories, have given this important section their attention, and brought together some excellent examples. Space will only permit us to show one of these, *i.e.*, fig. 5, which is a finely-modelled example of a bell-push plate in real bronze, finished in natural colour.

Other examples of which we might make mention are a 2-way bell push or switchplate and a door bell push repectively, both in real bronze, finished in brown, with relief in antique.

New Ediswan Fittings and Accessories.

The Edison & Swan United Electric Light Co., Ltd., are showing some new styles of electric light fittings, as illustrated in figs. 1 to 5. The speciality about these is not only in the design, but in the finish and manufacture. The fittings are hand-made throughout, being constructed of antique brass or copper, fretted out of the sheet, riveted together and inlaid with real mother-of-pearl. The effect

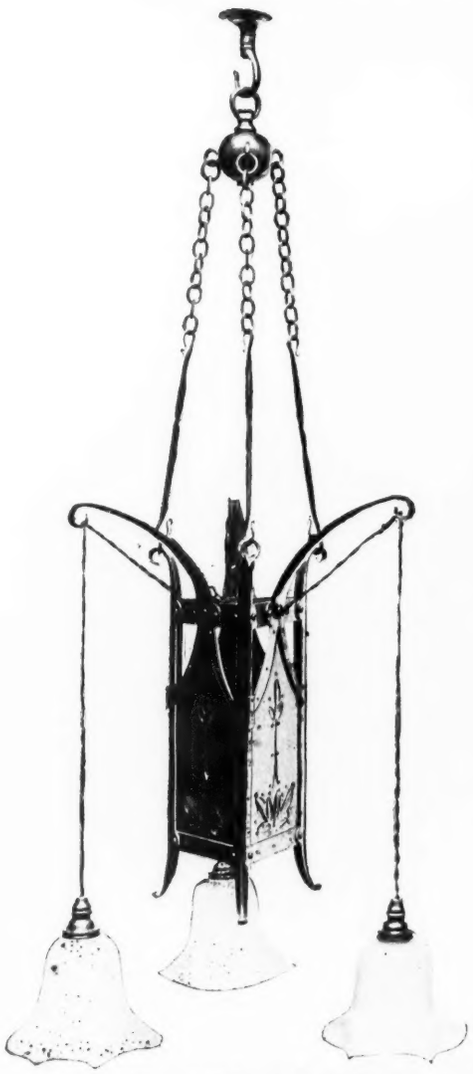


Fig. 1.—Ediswan 3-Light Electrolier.

is unique, and gives an Oriental tone to the fittings, which is very pleasing. A large number of designs in this style, both for electroliers and brackets, are on view at the Ediswan showrooms in Queen Street, E.C.

With regard to accessories, the "Ediswan" Co. are placing on the market a new point switch called the "Button" switch with their well-known "Wedge" tumler movement, but operated by means of a single plunger or push instead of a dolly. Up to the present, push switches have been confined to the double type, the operations of making and breaking being effected by means of two separate pushes, at the sacrifice of compactness and economy. Fig. 6 (see facing page) shows the new switch with flush cover, which is also made in other styles. It is anticipated that there will be a large demand for the flush cover patterns, but the company is also manufacturing the switch with the usual fluted dome cover. The first pressure of the push makes the circuit, and the second breaks it, or *vice versâ*; this cycle of operations is effected in a manner as simple as it is ingenious. On to the ordinary screw collar of the tumler switch is screwed a brass barrel, also threaded on the outside

to take a ring or cover, as shown by fig. 7. The ebonite push or plunger is hollow, and is provided with a flange which bears against a seating at the top of the barrel by means of a spiral spring, which thus keeps the push in its normal position. The push is hollow, and is provided with a cup-shaped recess, holding the half-round

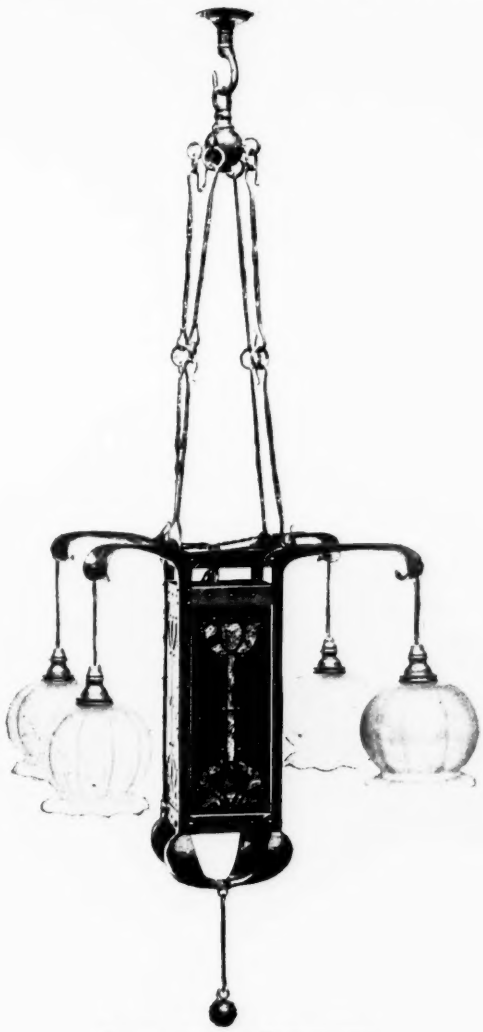


Fig. 2.—Ediswan Electrolier.

head of a brass pin, which is thus free to move in all directions. The end of this pin, when the push is pressed, falls normally into one or other of two slots on the brass lever holding the wedge bridge-piece, and on being pushed right home, moves the bridge-piece from one side to the other, according to whichever slot it falls into.

Fig. 3.—Ediswan 3-light Bracket.

The snap-off action is secured by a patent spring fixed to the side of the frame. This spring bears upwards on a pin fixed in such a position on the brass lever that immediately the bridge-piece has broken contact the pin is over the dead centre, and the spring causes the bridge-piece to fly back with a very rapid movement.

As will be seen, the flush cover switch is made for bringing the wires in at the side. The dome cover pattern has the wires brought in at the back in the usual manner, and the screw barrel is only threaded sufficiently to take the screw ring.

Fig. 8 shows a further novelty which the Edison & Swan Co. are introducing in the shape of a switch plug. It is usual for supply companies, consulting engineers and others to specify that every

Fig. 4.

Fig. 5.

Ediswan Brackets.

wall socket shall have a switch in series with it, either on the same wood base, or controlling it from the door in connection with high voltage supply, in order that the current may not be broken by the plug. The consumer, however, frequently does not trouble himself

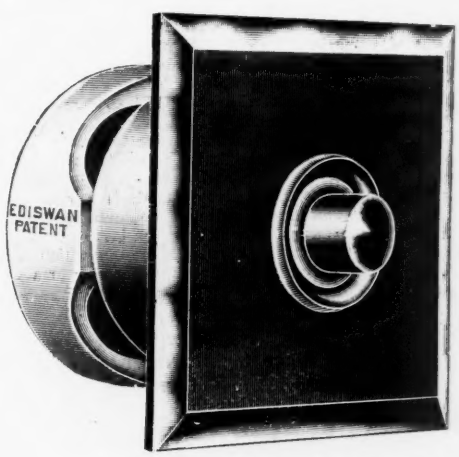


Fig. 6.—Ediswan "Button" Switch.

about this switch, but leaves it continually in the "on" position, so that the object of those who specify it is defeated. Another disadvantage of the ordinary wall socket is that when the wall

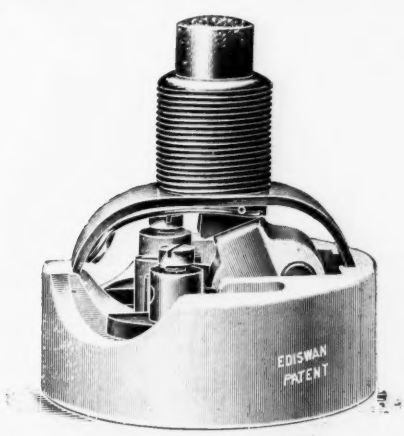


Fig. 7.—"Button" Switch, Cover Removed.

plug is withdrawn the terminals remain alive, and are capable of being short-circuited by mischievous persons. With the new Ediswan switch plug this is not only impossible, but all the advantages of a switch are obtained, without the necessity of turning a switch handle. The mere insertion of the plug closes the switch and makes the point alive, and its withdrawal opens the switch and leaves the point dead. In this respect it is unique

other types of combined switches and plugs require the insertion of the plug, and the turning of a switch handle. The simplicity of action of the switch plug can be partly gathered from the illustration. It will be seen that the ends of the prong are stud-shaped; on pressing the plug home, one of the prongs engages a cam fixed on the spindle of the bridge piece. This spindle is maintained in the off position by a mouse-trap spring; the movement of the cam revolves the bridge piece through a long path, and it is so shaped that only the last sixteenth of an inch or thereabouts closes the circuit. The two contacts are entirely separated by a stout porcelain partition. On withdrawing the plug, the stud-head of one of the prongs engages a small detent on the cam, which causes the circuit to be quickly

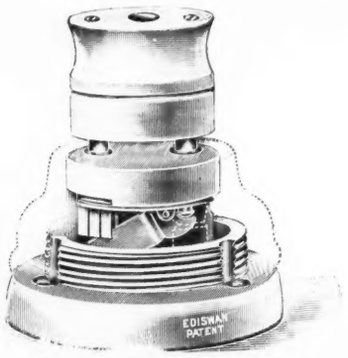


Fig 8.—Ediswan Switch Plug.

broken. The apparatus, which is made in two sizes, is strongly constructed, and is suitable for high voltage circuits.

The Edison & Swan Co. are also placing on the market their special "Wedge" switch with independent break, which is a further modification of their tumler switch. The principle of the contact-making device is similar to the usual standard tumler switch. The spring, however, instead of being inside the screw collar, is fixed to one side of the frame, and takes the form of a pinching spring, which bears on a diamond-shaped piece of iron fixed on the lever; the dolly is pivoted to the latter, but free to move independently. When the switch is turned off, the moment the circuit is broken, the spring, which is then just over the centre of the diamond, causes a quick snap-off action which is quite independent of the dolly. The advantages of this arrangement are obvious.

Stage Lighting.

Messrs. Ernest F. Moy, Ltd., of Greenland Place, Camden Town, N.W., have issued an illustrated circular relating to their

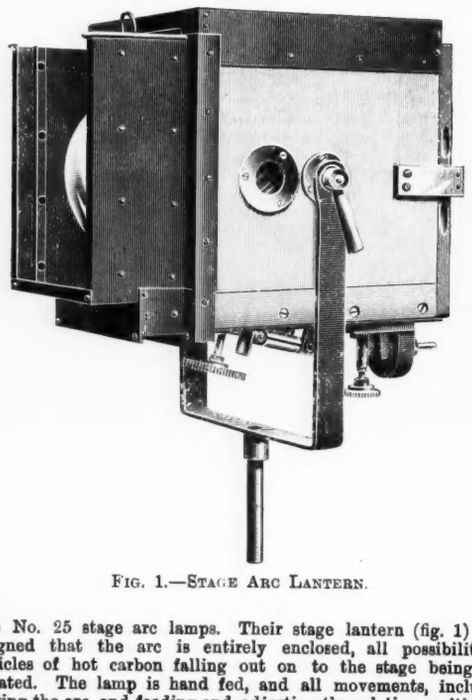


Fig. 1.—Stage Arc Lantern.

type No. 25 stage arc lamps. Their stage lantern (fig. 1) is so designed that the arc is entirely enclosed, all possibility of particles of hot carbon falling out on to the stage being thus obviated. The lamp is hand fed, and all movements, including striking the arc, and feeding and adjusting the relative positions of the top and bottom carbons, are made from outside the lantern (fig. 2). The lantern body is composed partly of oak lined with asbestos and sheet steel, and partly of a double thickness of sheet steel with an air space between. Ample ventilation of the interior of the lantern is obtained by air-holes placed in suitable positions so as to secure a natural draught between the linings without letting out stray light. Spectacle pieces are fitted in the sides of the lantern so that

Fig. 2.—Feeding Mechanism.

the condition of the arc may be observed. The leads from the carbon holders are brought down to an inverted two-pin plug base, carried on the lamp slide, so that the lamp may be rapidly disconnected and entirely withdrawn from the lantern for trimming or other purposes.

Bristol's Specialities.

The Bristol Electric Safety Lamp Works, of 40, Great Smith Street, Westminster, S.W., are introducing a new submarine electric lamp, consisting of a water-tight gun-metal or aluminium case, containing a 16-volt accumulator, which energises a small incandescent lamp fitted on one side (fig. 1). The lamp is provided with a reflector and a strong hollow lens, which is protected by a guard. The top of the battery case is screwed firmly down on to rubber packing, making the lamp water-tight at any practicable depth. The accumulator is of sufficient capacity to maintain about

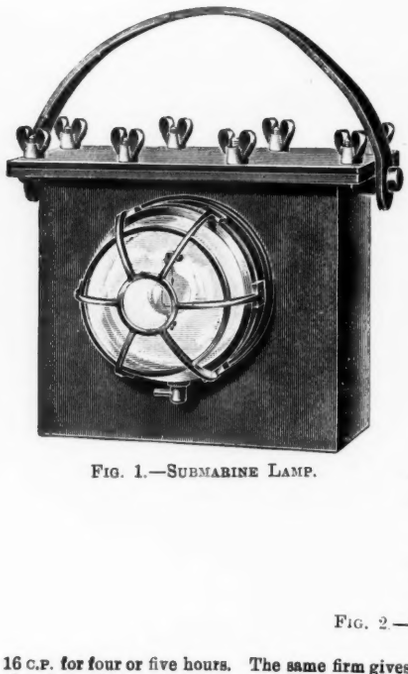


Fig. 1.—Submarine Lamp.

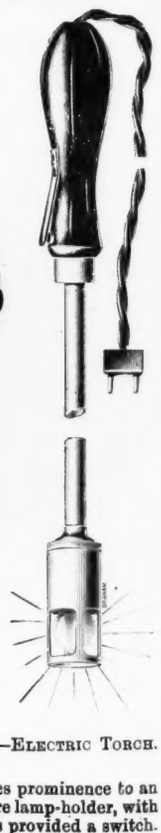


Fig. 2.—Electric Torch.

16 c.p. for four or five hours. The same firm gives prominence to an electric torch lamp (fig. 2), consisting of a miniature lamp-holder, with a handle of suitable length attached, in which is provided a switch. The lamp is well protected, and very light and compact; it will pass through an aperture of less than 1½ in. diameter, is well adapted for the inspection of motor-car machinery, &c., and can be used in conjunction with an ignition cell. Our illustrations will give a good idea of the construction of this apparatus.

A "Pivot Intermediate" Switch.

For controlling lamps from any desired number of points in a circuit, the above-named switch has been designed by Mr. A. P. Lundberg, of the Pioneer Electrical Works, Islington, N. It is claimed to be the first switch on a single base provided with tumbler action, ever

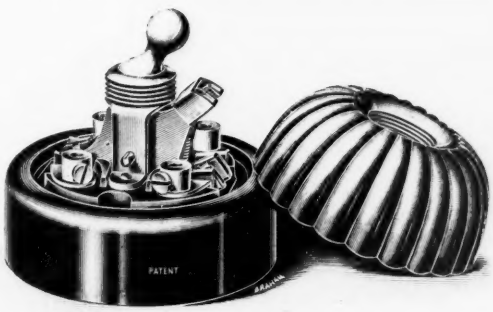


Fig. 1.—Pivot Intermediate Switch.

produced for "intermediate" wiring. Usually when tumbler type switches were specified for use throughout an installation, it was necessary to couple two two-way tumbler switches together for

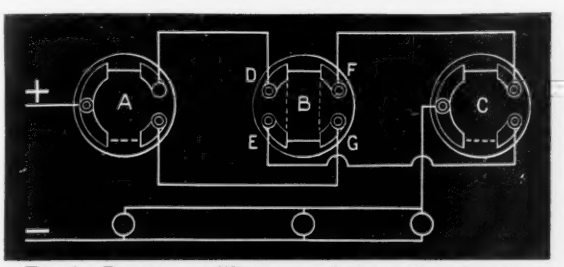


Fig. 2.—Diagram of Wiring for Intermediate Switch.

the purpose, for the intermediate positions, which resulted in an ugly fitting and more complicated connections. The diagram of connections (fig. 2) illustrates the arrangement of these switches. The

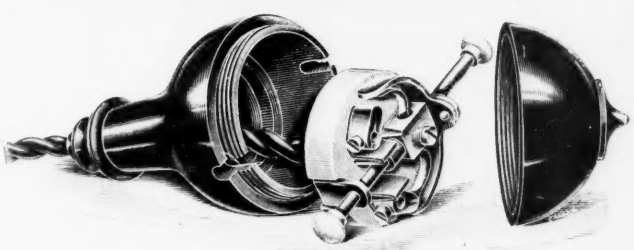
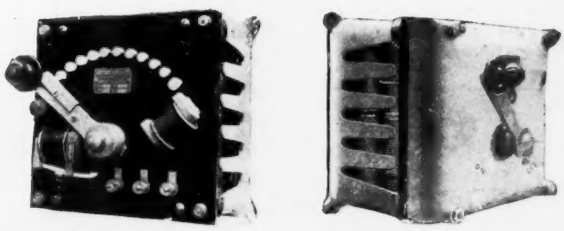


Fig. 3.—Improved Pear Switch.

method is found most useful for the lighting of corridors, staircases or large rooms, allowing of control from any door, floor or position. The "pivot intermediate," although a little higher, is of the same diameter as standard single and two-way switches of the tumbler type, and all covers, &c., used with those switches are interchangeable with it. It has a patent variable-leverage action, which is very definite; the patent *locked* type of cover can be fitted also, and large size loop-in terminals are provided. It can also be supplied for flush work, and all types of standard fronts, &c., are interchangeable. It may be conveniently used as a reversing switch, and is supplied as a parallel series switch for use in hospital wards, for night lights in nurseries, &c., this adaptation being accomplished by removing one of the contact pieces on the rocking contact arm. In Messrs. Lundberg's "improved bow-spring" pear switch, fig. 3, the current-carrying parts are mounted on a vitreous porcelain base, and a wider break is provided than in previous patterns. The porcelain base is easily removable from its containing case, to facilitate wiring. Our illustration shows the case unscrewed, and the internal switch fitting removed.

"J. & P." Motor Starters.

These starters, supplied by Messrs. Johnson & Phillips, of Old Charlton, Kent, although fitted with the usual number of no-voltage and overload coils, have a special mechanism whereby the starter cannot be operated against an overload, a feature which is frequently overlooked in some starters, with the result that starters are frequently burnt out, and great inconvenience and unnecessary expense arise through stoppage of machinery. The J. & P. starters, fitted with no-voltage and overload release coils, are adaptable for use not only with shunt and compound-wound motors, but also with series motors. Provision is also made for making the shunt in advance of the armature circuit, and breaking the circuit on a non-inductive resistance. For the smaller sizes of starter, a porcelain



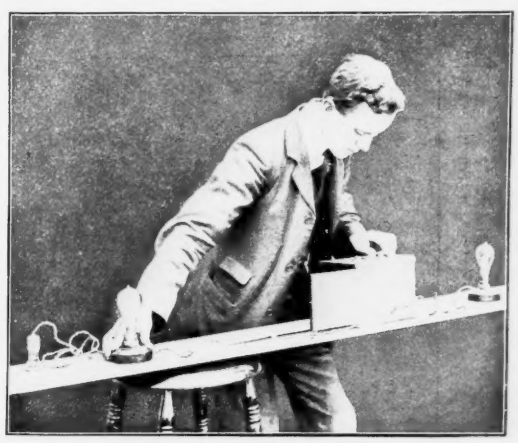
"Open" Class. "Protected" Class.

"J. & P." Motor Starters.

type resistance unit is used, while for the larger sizes an ironclad type, consisting of resistance material and insulation, clamped together by cast-iron caps, is used. In the latter resistance there is an entire absence of soldered joints, which, together with the solid construction of the units, ensures an absolutely indestructible resistance, even under heavy underloads. The resistance material is claimed to be of ample capacity, and the containing box is well ventilated, thus ensuring low temperature rise.

A New Photometer.

While enormous strides have been made in the efficiency of electric lighting, notably through the introduction of the Nernst lamp, but little has been done to facilitate the practical measurement of the light given. We illustrate a neat little instrument, which Messrs. Everett, Edgcumbe & Co. have brought out, for the rapid measurement of the candle-power of glow lamps. A somewhat crude



The New Photometer in Use.

photometer, which formed the basis of the present instrument, was described in the Electrical Review for October 10th, 1902, but since then the apparatus has been continually improved upon, until, although still sold at a moderate price, extreme accuracy in testing is possible with it. The accompanying figure shows the photometer in use. On the right hand will be seen the direct-reading scale, which takes the form of a spring tape, and, when not in use, coils itself up inside the case.

The photometer proper consists of a Trotter grid, which is inspected through a small glazed opening in the top of the case. A carefully "aged" and standardised glow lamp is used as the standard, and, owing to the fact that both this lamp and the lamp under test are run in parallel off the same voltage, no allowance need be made for changes of pressure. This is a most important point, as it must be remembered that a change of voltage of 1 per cent. produces a variation of 6 per cent. in the candle-power of the lamp. In this connection, it may be remarked that the usual method of measuring the voltage of the lamp under test by means of an ordinary voltmeter is far from accurate, and should not be employed if it can possibly be avoided. The method of measurement here employed may be described as a kind of "double weighing," and is such that any extraneous light or reflection from walls, &c., is automatically compensated for, so that the apparatus can be used equally well in broad daylight. This result, it is claimed, has never before been attained. The simplicity of the set is such that it is always ready for use, and can be worked by even the most inexperienced. Measurements can be made with extreme rapidity, and owing to the fact that the standard lamp is only used for, say, a minute during the test of a complete batch of lamps, its life may be regarded as practically indefinite. A very large number of these instruments are in use, and, in conjunction with the lamp-testing wattmeters (see Electrical Review, November 6th, 1903) or lamp-testing ammeters, manufactured by the same firm, are found to effect a great saving in the energy bill.

F

A Convenient Fitting for Temporary Illumination.

We illustrate herewith two views of a special design for temporary illumination. The fitting shown is adaptable for use either as a 6-light wall or pendant electrolier. In fig. 1 it appears taken to pieces, showing the screw and plug connections, which save wiring. Fig. 2 is a view of the same fitting dressed with crystals and glass festoons. The whole is made to be assembled in a few minutes, and is one of those specially designed for temporary lighting business by Messrs. Simmonds Bros, Ltd, of Newton Street, High Holborn.

Fig. 1.—Six-Light Wall or Pendant Electrolier Dismantled.

Fig. 2.—Special Fitting Erected as Pendant Electrolier.

primary considerations for such work are facility in fixing and easy packing for transportation. By the removal of three screws the lamps can be arranged two in series, or in parallel, as required.

Arc Lighting Specialities.

In the domain of street lighting the modern arc lamp occupies a prominent position, although to be effective it is necessary that the results be obtained with a minimum of attention to the lamps. In this connection the Union Electric Co., Ltd., of 151, Queen Victoria Street, E.C., have attained prominence with their Excello Intense Flame Arc Lamps, which burn for periods of 17½ hours on d.c. and 19 hours on a.c. circuits. The lamps are some 3 ft. 9 in. long, and are constructed for use either in or out of doors, with or without reflectors, and in several different finishes.

The firm's E.V. long-hour lamp is supplied both for 250 and for 100 hours' burning, and also with either single or double enclosure globes of artistic form.

A similar lamp is also supplied under the name of "E. V. S." for use on traction circuits. The particular advantage of the E.V.S. lamp is that it has enclosed in its cap an automatic cut-out, and a compensating resistance, so that the shunt coils are protected from an excess of voltage, and the other lamps in the circuit are protected from extinction should one of the carbons burn out. These lamps work without extinction with a change of voltage up to 80 volts on the line, although traction circuits are rarely sufficiently poor in copper and generator capacity to give such an extreme fall in volts.

E.V. Arc Lamp.

The company's experience has also covered some 5,000 miniature arc lamps, and they have decided in future to make both the original type of miniature arc lamp, and a long, or 22-hour, type. The solid handsome appearance of the bronze cover, and other more material advantages, are typical of the excellent design contained in these lamps, which are miniature only in size and embody all the advantages of the standard type of enclosed arc lamp, with reliable clutches, good dash pots, and interchangeable parts.

Coltru Lamp.

Coltru Daylight Lamps.

Miniature Arc Lamp.

Another speciality of this firm is the colour-true arc lamp. The "Coltru" daylight lamp, which burns either singly on 100 to 115 volts, or two in series on circuits of twice this voltage, fulfils the requirements of this class of work. The lamps require five amperes of current, burning for about 100 hours without change of carbons, and are differentially wound. They are constructed in two forms

to project the colour-true beams of light either downwards, or sideways, according to the nature of the industry in which the lamps are being used. The lamps have been tested on fibres, dry, wet, and liquid colours, and have proved themselves perfectly satisfactory. There appears to be a very considerable future for these lamps, not only for industrial purposes, but also for the lighting of certain high-class shop premises, such as florists' and silk merchants' show-rooms.

The Dolphin Electric Radiator.

The General Electric Co., Ltd., of 71, Queen Victoria Street, E.C., have issued a new electric radiator pamphlet, illustrating various new designs for heating rooms, state cabins of steamers, &c. The luminous or "glow" pattern of radiator is fitted with a polished aluminium reflector, which only requires occasional rubbing with a dry cloth to keep it in good condition. The heating lamps can be instantly fixed in the event of renewals. Special care has been given to the design of these lamps, and it is claimed that their life is very long, and the heating effect is well maintained throughout. All the radiators shown are supplied with an improved form of holder for ensuring

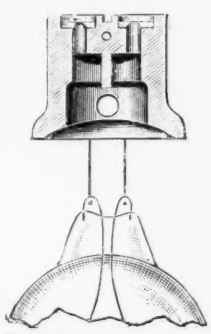
The "Dolphin" Radiator.

perfect connection. The Dolphin pattern, of which we give an illustration, is of ornamental appearance, and consists of a hammered iron base, and a highly lacquered hammered copper reflector, and is fitted with three lamps and two switches.

A heating pad is being supplied which it is considered will be found far more convenient than hot water bottles, poultices, &c.; in cases where electricity is available, it is ready for use at a moment's notice, and forms an ideal method of applying heat to the body. These pads are in appearance similar to a pad of thick lambswool. Other kinds of electrical heating or cooking apparatus are to be found in Section H. of the G.E. Co.'s extension catalogue.

Electric Lamp Collar.

The Cleminson Electric Lamp Attachment, Ltd., of 27, Brazennose Street, Manchester, are supplying a new patent high insulation electric lamp collar, a cross-sectional view of which is shown herewith. It will be seen that the connecting wires which pass through the collar are well insulated from each other, and the collar is attached to the lamp with the makers' special patent non-porous cement, so that damp cannot get to the contacts. The lamp is claimed to be absolutely damp and chemical-proof. Chemical manufacturers and others who use lamps where they are exposed to the action of acid vapours or alkaline dust, and in situations where they are intermittently exposed to steam, are familiar with the damage arising from corrosion of the brass fittings of ordinary lamps. In this connection it may be pointed out that the Cleminson fittings are made of resistant materials, and, it is said, may even be subjected to the direct influence of liquid chemicals without any damage arising from such contact. With this device it is claimed to be practically impossible to get a short circuit or an earth, thereby minimising the danger of fire and effecting a saving in consumption of energy.



Electric Lamp Collar.

Electric Candle Lamps.

The Hunter Electric Candle Lamp Co., Ltd., of 77, Newman Street, W., are supplying the "Huntalite" patent electric candle lamp, which is shown below (fig. 1). It has been introduced with a view to providing a perfect imitation of the wax candle. The body of the lamp is composed of a specially prepared enamelled glass tube, the exact diameter of an ordinary wax candle, and bearing the closest possible resemblance to wax. At the top is annealed a clear glass cone, with slightly concave sides, which contains the filaments in series; these are supported on a glass rod fitted in the bottom of the tube immediately above the cap. The whole of the lamp being carefully exhausted, it will at once be apparent (the body of the

Fig. 1.—The "Huntalite" Electric Candle Lamp.

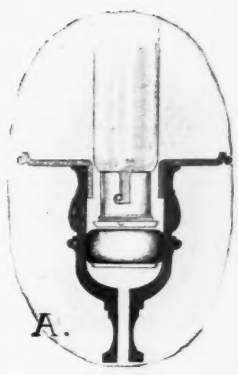


Fig. 2.—"Huntalite" Holder.

lamp being free from all obstructions) that the interior of the tube is illuminated and assumes the transparent appearance of a wax candle. The filaments are constructed and placed in such a position as to produce the effect of a candle flame, and the clear glass cone entirely disappears from view when illuminated. The attachment is simple, as an ordinary small B.C. holder can be used, but the makers have introduced two forms of holder which have been specially constructed for use with the Huntalite lamp. One of these (fig. 2) has been made to overcome the difficulty of adapting fittings already wired and in position, without the necessity of rewiring; the other is made to screw into the candle sconce.

Colliery Fuse Box.

Messrs. John Davis & Son, of All Saints' Works, Derby, have designed a new fuse box, of which we give an illustration (fig. 1), particularly for their own special work. It can be used as a switch-box, fuse-box, and plug-connecting box for trailing cable. It is only made single pole, as owing to the various methods of running cables in collieries, it has been found more useful in this form. The firm's No. 4 type watertight lamp fittings (fig. 2) will take a

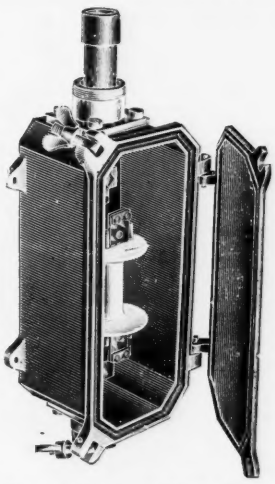


Fig. 1.—Colliery Fuse Box.

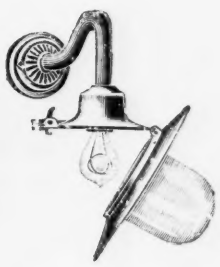


Fig. 2.—Water-tight Fitting.

lamp up to 32 c.p., the glass and carrying ring being hinged, thus making the lamp easy of access. The method of fastening is novel, and there is no liability of losing the fixing screw. The fitting is made up with a straight stalk, swan-neck bracket, or as a swan-neck pole-top fitting.

D.P. Switch, and Ignition Battery Charging Apparatus.

Messrs. Offord, Wilson & Barfield, of 98, Woodcock Street, Birmingham, have recently introduced a double-pole switch enclosed in a cast-iron case, and suitable for pressures up to 250 volts; fig. 1 shows the 25-ampere size, with cover removed. The special feature

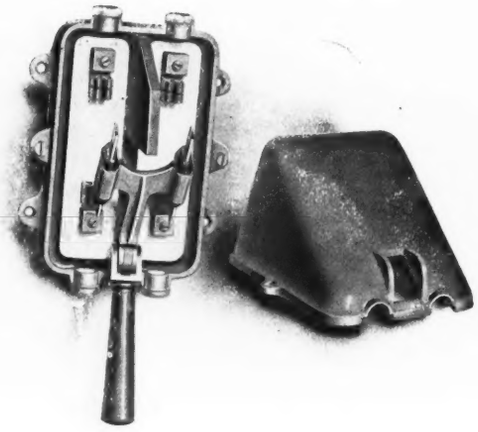


Fig. 1.—25-Ampere Ironclad Switch.

of the switch is the arrangement of the handle, whereby the customary slot in the case is avoided. The contact blades are clamped in strong malleable iron castings, from which they are separated by moulded insulation, and the contacts are mounted on separate porcelain bases. All current-carrying parts are insulated from the handle and frame, and the switch has a double and quick break.

Fig. 2 shows a set of apparatus specially designed for garages and similar places, for charging ignition calls with economy, no matter what the pressure of supply may be, or whether it be D.C. or A.C. The set comprises a motor-generator with switches, resistances, meters, and a connection board; the apparatus shown is arranged for 200—230 volts supply, the dynamo giving 6 amperes at 35 volts, and it can be used for simultaneously charging six 60-ampere-hour motor-car cells, or 18 20-ampere-hour cycle cells, or a combination

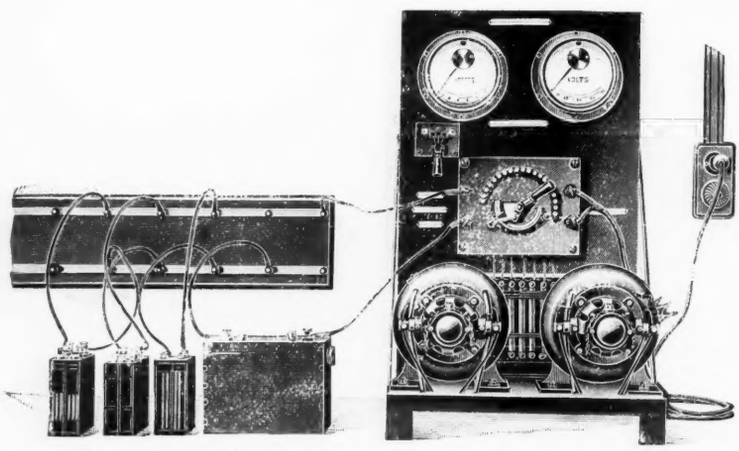


Fig. 2.—Ignition Battery Charging Apparatus.

of these. The apparatus can be supplied fitted up to suit any requirements, and is connected up to an ordinary lampholder or wall socket. As the charging of small groups of cells from the mains through resistances is exceedingly wasteful, it is evident that a considerable economy can be effected by using this apparatus.

Some G.E. Lighting Novelties.

The General Electric Co., Ltd., of 71, Queen Victoria Street, E.C., are, amongst numerous other things, making a speciality of a Nernst lamp fitting for street post. The design has been well thought out, and leaves little to be desired. The arrangement of the inner reflector and lamp is very neat, and the whole fitting is substantially constructed. The hood is hinged to enable it, when unlocked, to be swung back for the purpose of cleaning or replacing the glass and lamp fittings. A special double-pole switch is provided, in a convenient position at the head of the post. These

Nernst Street Lamp Fitting.

lanterns should be found particularly useful for piers, jetties and general town lighting.

The Robertson "Verebest" lamp is an entirely new departure from the ordinary type, and is designed to give a far brighter and more pleasing effect for indoor and general illumination. The bulb is frosted with the exception of the uppermost part, which is purposely left clear. A very small shade is provided, the shape of

Robertson "Verebest" Lamp.

which has been designed to give the maximum of light, without any of the sharp shadows which are generally found so troublesome in lamps of high candle-power. The light is pure white, and of a very agreeable and soft nature, there being a total absence of "glare," although the increase of candle-power is very marked. These lamps consume no more current than the ordinary 16-C.P., and do not blacken at anything like the rate of ordinary lamps.

The company are also introducing a very compact form of "Angold" arc lamp, which is suitable for large showroom, shop or window lighting, and is particularly adapted for fixing to ceilings, &c. The bulb is usually of a spherical shape, but pear shape is also supplied when desired. The size overall is 24 in. These lamps are made to suit all circuits from 100 to 250 volts.

The company's "Pedestal" house-service main fuse has been designed to meet the requirements for high-voltage circuits—up to 500 volts—and will be found exceptionally well made. The fuse terminals are mounted on porcelain insulators, and the leading-in holes are substantially insulated with porcelain bushes, a large

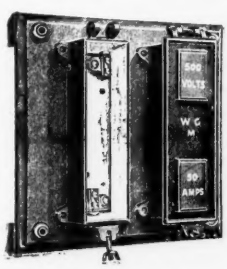
clearance being allowed between the terminals and the case itself. This allows of easy access and replacement of fuses without any risk of "shorts" to the frame. The fuses are supplied with plain or

"Pedestal" Main Cut-out and "Mordey" Fuse.

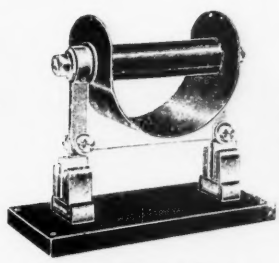
spring-clip terminals, the latter being made to take a "Mordey" fuse. The sizes vary from 25 amperes to 100 amperes. The "Pedestal" cut-out is also supplied to suit "concentric" systems. For this purpose it is suitably mounted and provided with special means for effectually insulating the concentric cable.

High Voltage Accessories.

We illustrate herewith several of Messrs. Ward & Goldstone's high voltage accessories, which we understand have had a very favourable reception from the trade. The Vitro fuse box with its special china lining is especially popular, owing to the long break of the fuse and the high insulation of the interior. The ironclad "Dutton" D.P. enclosed switch, which is illustrated, goes well with the Vitro fuses for power work and generally as a main switch. The Guardian



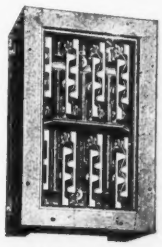
"Vitro" Fuse Box.



"Guardian" Fuse.

"Olaf" Fuse Carrier.

"Dutton" D.P. Switch.

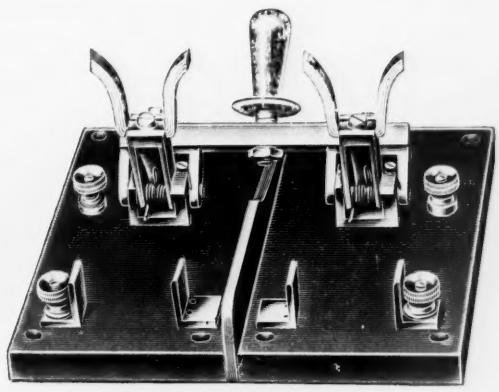


Fuseboard.

Hand Shield fuse, as a high voltage heavy current fuse carrier, is a very strong and reliable article, and the standard fuseboard, which was among the first boards introduced with replacement fuses, has been recently brought up to date, with improved and cheapened methods of manufacture, without any deterioration in the quality. An illustration is also shown of Ward & Goldstone's "Olaf" fuse carrier for their best quality fuseboards.

Main Switches.

Messrs. Moores, Farrell & Co., of Mynshulls House, Victoria Street, Manchester, are making a speciality of main switches for varied purposes. Their lines include the "E.M.E.F.F." square patterns of simple turn switch for small work, the "Victoria" type of single and double-pole switch which has been designed to meet



"Ellesmere" Locking Switch.

the demand for a cheap, but substantially-built switch, and the "Ellesmere" pattern locking switch, which, with a view to overcoming the effects of vibration, is provided with a trigger on the pedestal, so arranged that in putting the switch on, the latter is automatically locked in position, and can only be released by means of the handle.

"Mynshull" Switch.

These switches are provided with laminated contacts, and have long quick breaks. Another switch supplied by the firm is the "Mynshull" type, which is worked on the lines of the well-known knife pattern, having an independent and quick break. All the current-carrying parts are of high-conductivity copper, and the switch generally is well finished.

Life and Candle-power of "Linolite" Lamps.

We recently published some extracts from a report on the candle-power of the "Linolite" lamps (the Linolite Co., 47, Victoria Street, S.W.) by Mr. J. S. Dow, at the Central Technical College. Further tests have now been made to determine the efficiency and life of the special tubular lamps used in this system. Four lamps were tested by themselves, and other four in position in the reflector whilst running. The voltage to which the lamps were subjected was liable to a variation of 3 or 4 per cent. up or down, so that the conditions corresponded with those obtaining in practice.

The results of the tests made by Mr. Dow show that, while one lamp failed at the end of 650 hours, the remainder were still "alive" at the end of the test, which lasted 1,200 hours. The average decrease in candle-power during the first 1,000 hours was about 15 per cent., and it was proved by comparison that the reflector exerted no prejudicial effect on the life of the lamp. A curious feature of the test was the fact that the watts taken by each lamp remained practically constant throughout. The inefficiency at starting averaged 3·73 watts per candle, of course without the reflectors. The results of the tests were, therefore, distinctly favourable to the lamps.

The Peebles Brilliant Arc Lamp.

The accompanying figures show exterior and interior views of the new arc lamp which Messrs. Bruce Peebles & Co., Ltd., of Edinburgh, have recently put on the market. The essential features of this lamp are:—The use of inclined carbons with gravity feed, the fact that the carbons are impregnated so as to give a light of an agreeable golden yellow colour in place of the usual glaring white

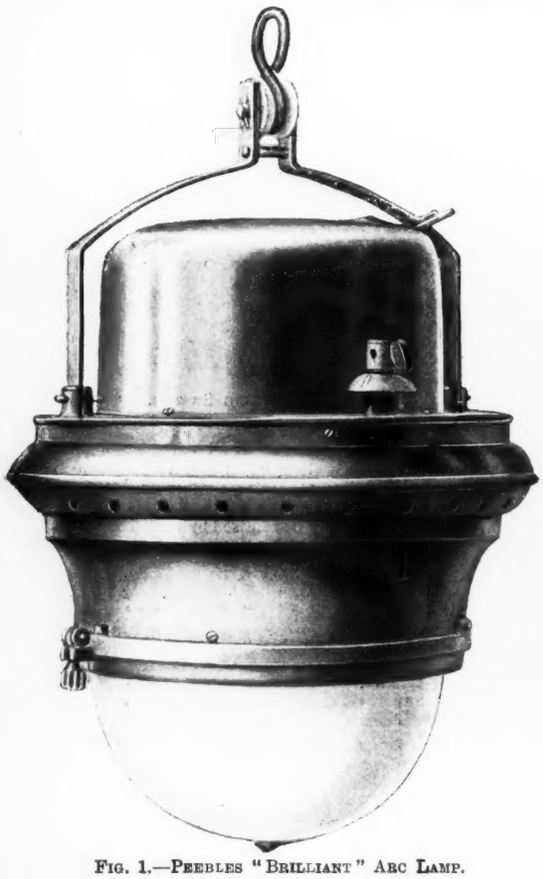


Fig. 1.—Peebles "Brilliant" Arc Lamp.

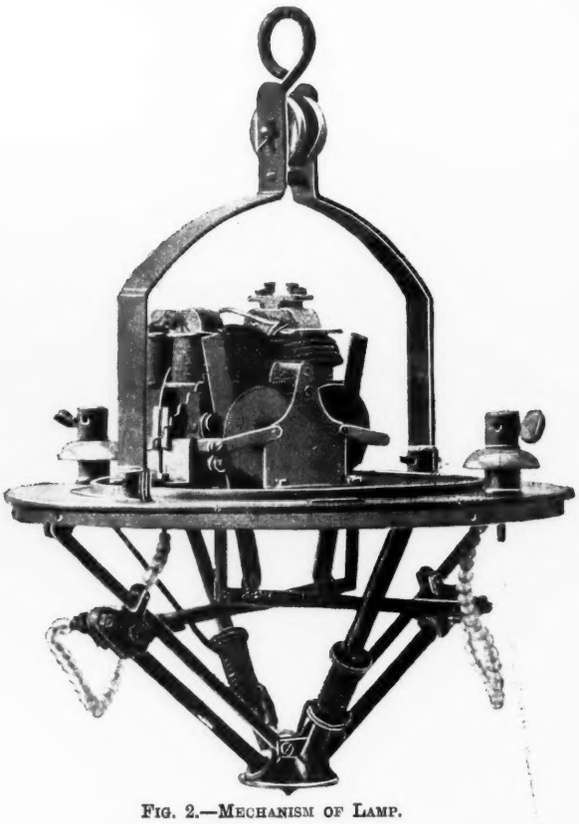
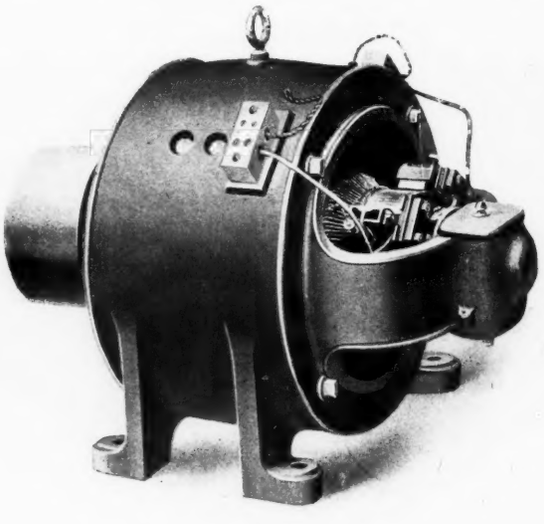


Fig. 2.—Mechanism of Lamp.

light, the suitability of the lamp for operation on either continuous or alternating-current circuits, and the simplicity of the working mechanism. An idea of the compactness and attractive appearance of the lamp will be obtained from the illustrations, which are reproduced from photographs of an 8-ampere lamp. We understand that the lamps work at 30 to 42 volts, depending on the candle-power and the particular type, and take from 8 to 18 amperes. Either two or three lamps can be run in series on 110 volts with a varying amount of ballasting resistance in series; another arrangement frequently adopted is to run 10 to 12 lamps on a 400 or 440-volt circuit. Continuous current lamps are provided with substitutional resistances, and the alternating-current lamps with choking coils, which come into action should the lamp go out for any reason. The mechanism as already stated is of a very simple order, and occupies very little room. There are the usual shunt and series coils, and above them is pivoted a lever, the ends of which support armatures above the cores of these coils. At starting, the shunt coil attracts its armature powerfully, and there being no current in the series coil, the shunt armature is drawn right down on to the shunt-coil core. This has the effect of bringing the carbon tips in contact and striking the arc. The carbons are then slightly drawn back by spring action, and the arc established. The spring action does not come into operation except at starting. The gravity feed is under delicate control. The carbons in slipping down set in motion a circular disk about 3 in. in diameter, which revolves at a relatively high speed. When the carbons have been fed so close together that the current rises above a certain value, the action of the series coil applies a brake to the edge of the disk and prevents further feeding. The lamps burn for 4, 8, or 16 hours, as required. Carbons of rather smaller diameter than usual are used, and as a consequence a considerable length of carbon is consumed. There is, therefore, a considerable amount of ash produced, and it is important that the globe should be carefully cleaned every time the carbons are replaced. The makers claim that the consumption in watts per candle is only about one-third of that of the ordinary arc lamp with vertical carbons.

Dynamos and Motors.

Mr. H. B. Brooks, of Granville Works, Tennant Street, Birmingham, is placing on the market some machines of new design. The frame, which also forms the magnet yoke, is of cast-iron in the smaller, and cast-steel in the larger, sizes, and is split horizontally, to facilitate inspection, or removal of the armature. Laminated magnet poles, securely bolted to the yoke, are used in conjunction with the cast-iron frame, but in the larger sizes, where steel is the foundation, the poles are cast with the yoke, and laminated pole-faces fitted. The end covers are so arranged that the position of the oil well may be varied, to enable the machine to be fixed, with equal facility, to the floor, wall, or ceiling. The bearings are fitted with heavy phosphor-bronze bushes, and ring lubrication. The field coils are machine wound, and the armature is of the former-wound, slotted drum type, built up of thin iron laminations, the iron being especially

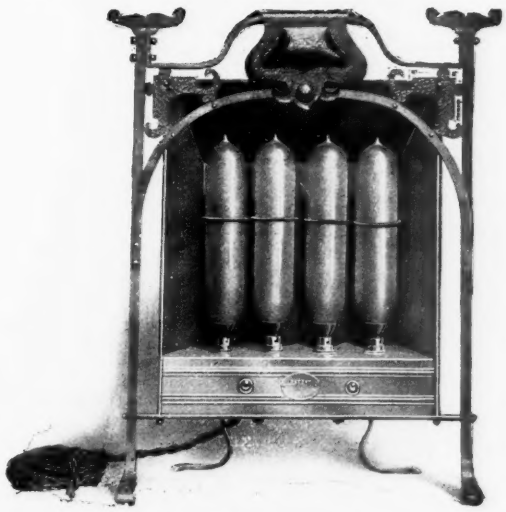


Brooks Motor.

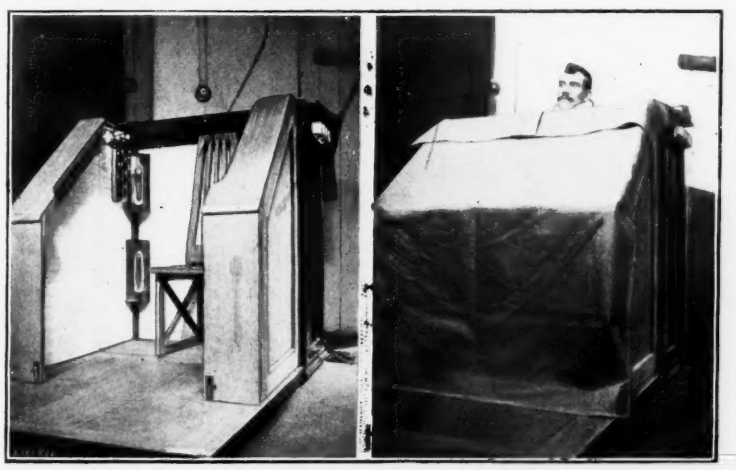
selected, and keyed directly on to the shaft. The commutator shell is a special feature of this machine, the face being a perfectly plain disk. There being no holes or projecting nuts, the risk of accidents is reduced to a minimum, and cleaning is greatly facilitated. The motors are generally suitable for driving printing machinery, pumps, power presses, &c.

The "Solarium" or Electric Sun Bath.

The Solarium (Dowsing's patent) is claimed to be a great advance on all cabinet baths where hot air is employed. It has been introduced by the Dowsing Radiant Heat Co., Ltd., of 24, Budge Row, Cannon Street, E.C., a firm well known as specialists in radiant heat and light treatment. The Solarium does not depend upon the heating of the air only, as direct light and heat rays (as from sunshine) are thrown upon the body from the electric heaters fixed in the cabinets. Patent reflectors are employed to direct the light and heat rays upon the person, and the surrounding air is also heated. The Solarium is substantially built, is ready for use in about one minute, and can be shut up as quickly. Wherever electricity is in use, the bath can be connected up by means of plug and socket; the energy used is about ½ unit, more or less, according to length of application, and 15 minutes is usually found sufficient. These cabinets are supplied to work on any voltage, from 50 to 250, on either alternating or continuous current circuits. The Dowsing Co. have always made a speciality of electric radiators, and from among their numerous designs we illustrate an artistic example in antique hammered copper, provided with four lamps and a patent reflector, also two switches and the necessary flexible for connecting up.



Dowsing Radiator.



"Solarium,' Open and Closed.

Electric Lighting with Nernst and Jandus Lamps.

Messrs. Drake & Gorham, Ltd, of 66, Victoria Street, Westminster, have registered a new pattern of Nernst lamp, model "A 1," with a case of British manufacture. This has been specially designed for use out of doors, though it is also suitable for lighting shops and large rooms. The lamp is suspended from a swivelling hanger, and consists of a cylindrical case into which the lamp body (identical with that of the "A" type) is fitted. The main terminals are outside the case, beneath the hood; two screw plugs pass through the outer cylindrical case, and when these are taken out the lamp body is entirely disconnected. The half-hood reflector, shown in fig. 2, can be used with this model, adapting the lamp for shop window lighting. A variety of other fittings for Nernst lamps are also made.

Fig. 3 shows the Jandus inverted enclosed arc lamp for direct current, fitted with a white enamelled case and an opal reflector. This lamp takes 4 to 6 amperes, and burns for 120 hours.

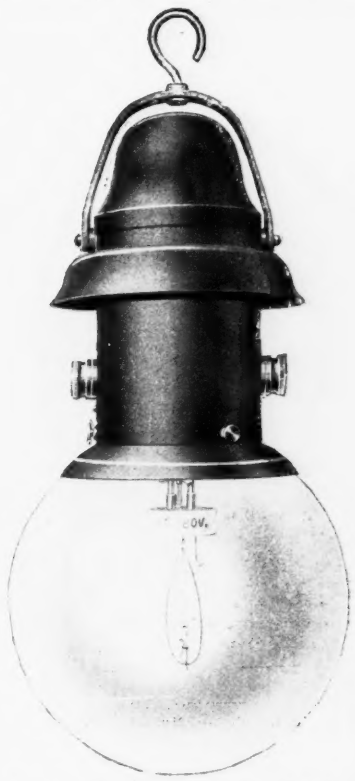


Fig. 1.—Nernst Lamp, Model "A1."

The Jandus Midget lamp, with double enclosure, shown in fig. 4, takes 2 amperes at 100 volts, and is noteworthy for its long burning hours—80 hours on the average. This is a very neat little thing, and weighs only 10 lbs. complete, with a total height of 18 in.

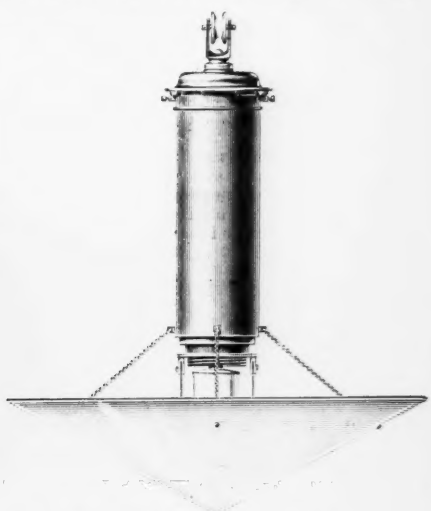


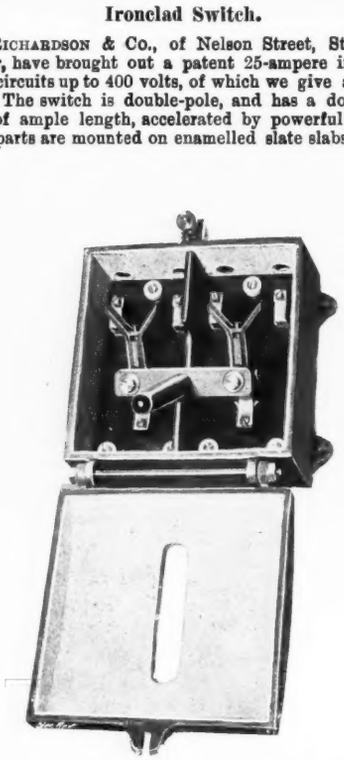
Fig. 3.—Inverted Jandus Lamp.

Fig. 2.—Half-hood Reflector for Shop-window Lighting.

Fig. 4.—"Midget" Double-enclosure Jandus Arc Lamp.

Ironclad Switch.

Messrs. Richardson & Co., of Nelson Street, Stretford Road, Manchester, have brought out a patent 25-ampere ironclad switch for use on circuits up to 400 volts, of which we give an illustration herewith. The switch is double-pole, and has a double break on each pole of ample length, accelerated by powerful springs. The live metal parts are mounted on enamelled slate slabs, separated by

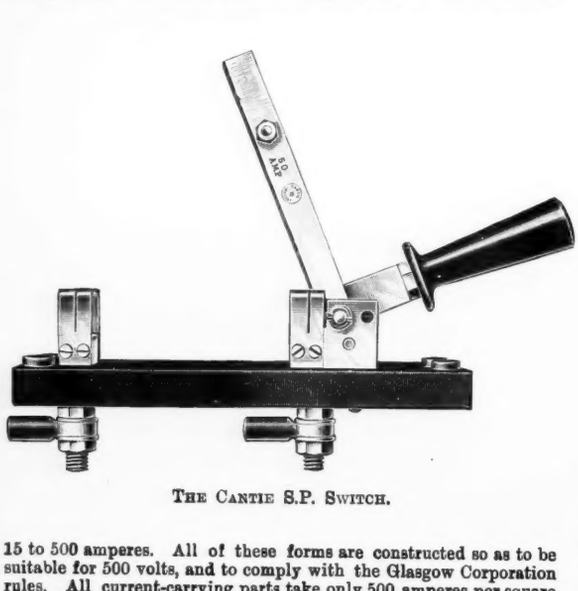


Richardson 25-Ampere D.P. Switch.

an insulating partition, and insulated from the case by porcelain insulators. The contacts are of laminated copper, with a simple means of adjustment, and the connections are made on the front. The whole of the interior of the iron box is lined with asbestos board, and the holes for bringing in the cables are bushed with insulating material. The handle passes through a slot in the cover.

Cantie Switch.

The switch shown in the figure has as one of its special features an exceptionally quick and positive make as well as break, and partial or intermediate movement is said to be impossible; another point is the effective bolting of the contacts in the "on" and "off" positions. It is made in all forms, such as S.P., D.P., T.P., tandem, change-over, enclosed in ironclad box, &c., and in all sizes from

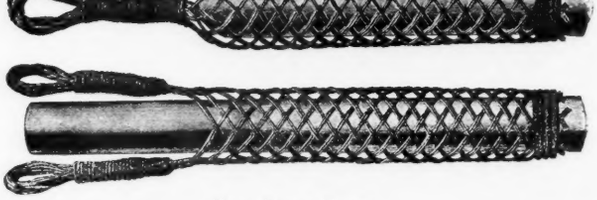


The Cantie S.P. Switch.

15 to 500 amperes. All of these forms are constructed so as to be suitable for 500 volts, and to comply with the Glasgow Corporation rules. All current-carrying parts take only 500 amperes per square inch, and contact surfaces 300 amperes. The mechanism is simple, and it is claimed that the switch cannot be tampered with or get out of order. It is supplied by Messrs. Marsh, Son & Co., Ltd., of 15, Gerrard Street, Soho, W.

A Useful Attachment for Cable Drawing.

A novel manner of drawing cables at Sheffield, which has been brought to our notice, consists in the use of Felten and Guilleaume cable grips (as shown in the illustration) attached to a powerful traction engine. Most engineers will at once appreciate the enormous strain upon the grip, which holds on with such tenacity that either the rope or the cable will have to give way before a failure in drawing can occur, as, on account of the construction of the grip, the greater the pull the more securely it holds.



New Cable Grips.

Mr. Rowland Hibbins, of the Sheffield Corporation electric supply department, has had experience of the great utility of the grip, which he has put to the severest strains with very satisfactory results. Engineers to other Corporation and company supply systems who wish for further information on the matter, should communicate with Messrs. W. F. Dennis & Co., 49, Queen Victoria Street, E.C., who are selling the grips in this country.

The "Gem" Miniature Enclosed Arc Lamp.

Mr. A. W. Richardson, of Skew Bridge Works, Worsley Road, Patricroft, has designed this arc lamp on the same lines as the well-known "Richardson" double enclosure long-burning arc lamps, which has gained much favour with electrical contractors for simplicity, durability, and good burning. The "Richardson Gem" is of the single-enclosure type, and is made in three sizes, viz., 2 to 3 amperes, 4 to 5 amperes, and 6 to 8 amperes, burning singly across 100 to 110 volts, and any number in series, allowing 90 volts per lamp, burning 50 to 90 hours with one pair of carbons.

The feed is of the well-known and tried "Richardson type," acting directly on the carbon, which system Mr. A. W. Richardson

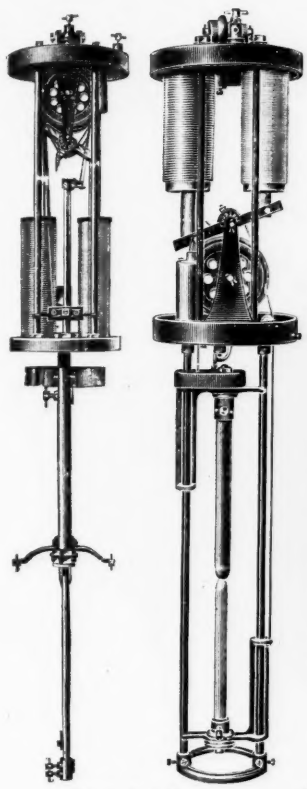
"Gem" Enclosed Arc Lamp.

claims to have originated. All parts of these lamps are made to "jig," and are, therefore, interchangeable, so that there is no difficulty in obtaining and fitting spare parts. Separate line resistances are supplied of the "Richardson" enclosed type, being entirely encased in a cast-iron fireproof box.

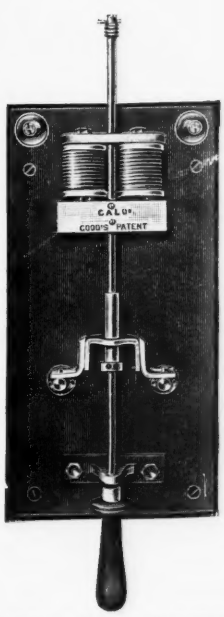
These lamps are said to have a very high lighting efficiency, and it is claimed that the light obtained from the Intermediate Miniature size, taking 4 to 4½ amperes, is above that given by the average double enclosure arc lamp, taking 7 amperes. They are of sound mechanical construction, and the two smallest sizes are of brass and copper throughout. The maker gives a 12 months' guarantee with all lamps of this type.

The Codd Arc Lamp.

This lamp is constructed in both single and double-carbon types—the former arranged for burning from 8 to 20 hours, and the latter from 30 to 40 hours. The unique feature of the lamp is, that the gripping, revolving, and slipping of the brake-wheel are effected solely by the action of a pair of peculiarly shaped surfaces on the rocking bar, which produce a "tensioning" effect upon the brake chain. The lamp has a very positive action and has only one adjustment, viz., the screw plate for initially securing the chain; once the latter is fixed, the lamp mechanism is permanently self-adjusting. The materials employed are for the most part incorrodible, and every part is accessible. The double-carbon lamp-brake mechanism is similar to that described, there being two sets of "surfaces" on one rocker-bar and two brake-wheels.



Codd Arc Lamps.



The Codd Circuit-Breaker.

The Codd Arc Lamp Co., Ltd., of Standard Works, Dame Agnes Street, Birmingham, also specialises in a patent automatic circuit-breaker, which we illustrate. It is designed chiefly for use in short series arc lamp circuits to safeguard the shunt coils of the lamps in the event of a pair of carbons hanging up or burning out, and displaces cut-outs and substitutional resistances on each lamp. Its action is simple; the handle and central rod has attached to it a rectangular armature, which, when the loose contact sleeve (supported on a collar on the central rod) has engaged the electrical contacts and energised the electro-magnet, is held up, but only so long as the current maintains its proper value. If the carbons of a lamp are burning out, the electro-magnet becomes weak, and unable to support the armature and central rod, and the latter, in falling, hits the loose sleeve smartly, causing it to fall and break the circuit. This switch is designed to replace an ordinary switch at a very slight extra initial cost.

New Oil Switch.

The Sunbeam Lamp Co., Ltd., of Park Road, Gateshead-on-Tyne, are supplying a new design of triple-pole 50-ampere 600-volt oil-break switch. The switch, though primarily got out to meet the requirements of polyphase power circuits, is equally suitable for use with continuous current apparatus, and it is so designed as to be reliable under the most severe conditions of operation, and suitable for all voltages up to 600. The special precautions which have been taken to obviate an arc, and to simplify the connections, and the fact that the switch has only one moving part, are claimed to render the arrangement practically proof against anything except deliberate mechanical violence. The framework consists of one casting, designed to shield the switch and to enclose the porcelain terminal blocks. The switch is quick-break, a double break being provided on each pole, and the six contacts are mounted on a stout asbestron cylinder: the moving contacts consist simply of three solid copper blocks, embedded firmly in a triangular asbestron carrier, revolving with the operating spindle.

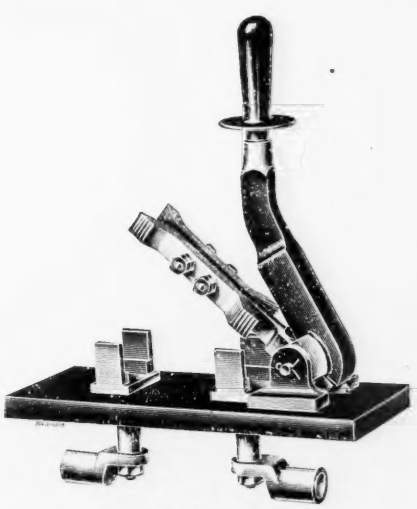
Among the special features claimed by the makers (Messrs. Reyrolle & Co.) are the following:—The break occurs simultaneously on all three poles; in opening the switch, a solid body of oil is put in motion, and forced past the contacts, thus promptly extinguishing any arc; the parts are few, and all are interchangeable, being machined to gauge; the oil receptacle can be removed at any time

Triple-Pole Oil-Break Switch.

without loosening any of the connections or interfering with the mechanism of the switch; the terminals have been specially designed to facilitate wiring, and the framework of the switch is arranged for an earth connection, while the switch handle is insulated, and has a definite "off" and "on" position; the switch itself is water-proof, and can be used out of doors, on cranes, &c., on board ship, or in mines.

Improved Knife Switch.

This switch, which is illustrated herewith, has been specially designed by Messrs. Cecil Hodges & Co., Balfour House, London, for heavy traction work. The contacts are of heavy cast gun-metal, machined up; the blade is formed of hard rolled copper, laminated, and on the switch being closed each lamination can be seen making its own individual contact between the switch jaws, which are thus bridged directly across by the copper brush. This is claimed to be a great improvement on the old arrangement of soldering copper



Hodges's Knife Switch.

clips into brass holders, which eventually develop faults, and give trouble. There is also the advantage of being able to renew the copper brushes, as they can be easily detached, and the contacts can be adjusted for wear if necessary, by inserting a liner between the brush and the carrying arm. The handle arm is made from a malleable iron casting, so as to ensure great strength, and is stove-enamelled black with nickel plated facings; the working parts of the switch are highly burnished and lacquered, and the result obtained is a switch having the greatest amount of mechanical strength combined with high electrical efficiency.

Electric Street-Lighting Fittings.

The Reason Manufacturing Co., Ltd., of Brighton, so well known in connection with their extensively adopted demand indicators, have also specialised in electric street lighting fittings, in which they claim to have effected considerable improvements. Their spherical globe lantern, fig. 2, represents a recent development for Nernst incandescent or small arc lamps. It is supplied either with clear or frosted glass, and is practically air-tight and dust-proof. It is only necessary to unscrew the top finial to obtain easy access to the interior, the opening in the globe being 12 in. diameter. The illustration shows this lantern fitted with the firm's special reflector fitting, suitable for two incandescent or Nernst lamps; a switch and fuse are fitted in the stem.

Fig 1.

Fig. 2.

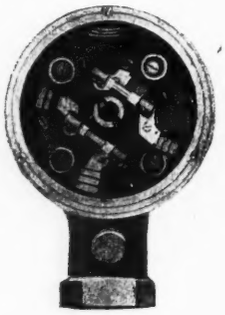


Fig 3.

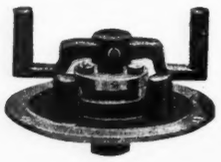


Fig. 4.

We also illustrate a double lantern fitting (fig. 1), with two well glass lanterns fitted with hinged copper covers. The bracket is an ornamental one, particularly suited for open spaces and prominent positions. This design is adapted for Nernst, incandescent, and small arc lamps, and can be supplied with D.P. switch and fuse fittings, as shown. The latter fitting and its cover we also illustrate in detail in figs. 3 and 4; the cases are absolutely watertight, and ebonite is used in all cases for insulation purposes. A gland is provided to the spindle, and the fuses are enclosed in a glass tube, and perfectly visible on opening the switch. The fuses are capable of breaking a five-ampere circuit with 500-volts pressure. Other items of interest are the Reason enclosed arc lamps, safety contact hoods, and winches for arc lighting installations.

Relay for H.V. Circuits.

The International Electric Co., of 55, Redcross Street, Barbican' E.C., are putting on the market a relay for H.V. circuit, which is shown in the accompanying figure. This device is intended for service, where it is desirable to operate an electric light or power circuit from a distance without necessitating the running of expensive cables all the way. The relays are operated by a battery current, but are constructed in such a manner as to allow of closing an electric light or power circuit up to 250 volts. Two types are being supplied—one which closes the circuit only as long as the battery circuit is closed by means of an ordinary bell push—while the second type, although actuated by a battery current, will permanently close the circuit until the contact is mechanically replaced by a pull, or chain, at the side of the apparatus. An aperture in front of the cover shows, immediately the light circuit is closed, a white disk which remains

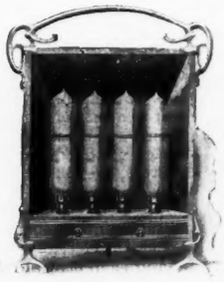
Relay for H.V. Circuits.

in position as long as the circuit is closed, and is automatically replaced when the chain at the side is pulled. The relays are wound in such a manner as to require no more than about 60 milliamperes, which means that four ordinary Leclanché cells will be sufficient for short distances to operate either of the two types. The capacity of the relay is 10 amperes at 110 volts, or 5 amperes at 220 volts.

Prometheus Heating Apparatus.

The British Prometheus Co., Ltd., of Kingston-on-Thames, reports a very ready demand for its various electric cooking and heating utensils, and new patterns are continually being added. The company lists close upon 400 different patterns in its recent 120 pp. catalogue. Hitherto the heaters sold have been of the "convector" type, but several patterns of the ordinary form of glow lamp radiator have been added to the productions of the firm. We illustrate the No. 90D design with an ornamental brass frame and copper body. The glow lamps used are of Ediswan manufacture. We illustrate a coffee or tea urn which has an earthenware interior, it being fitted with the patent self-indicating temperature regulator now fitted on a large number of the "Prometheus" utensils.

Electric Coffee or Tea Urn.



Prometheus Radiator.

The Siemens Electric Appliances, Ltd., of Watling Street, E.C., have issued an illustrative pamphlet describing their patent uninterchangeable safety cartridge fuses for currents up to 10 amperes at 250 volts, and 6 amperes at 500 volts.

Ironclad Switch-Fuse and Distribution Board.

Messrs. Marryat & Place, of 28, Hatton Garden, E.C., have devised the arrangement of combined switch and fuse for pressures up to 500 volts, shown in fig. 1. This is entirely enclosed in a cast-iron case, in such a way that the act of opening the lid breaks the circuit. The fuses are enclosed in tubes, which can be entirely removed from the box, and the tubes are easily opened for the purpose of replacing a blown fuse-wire.

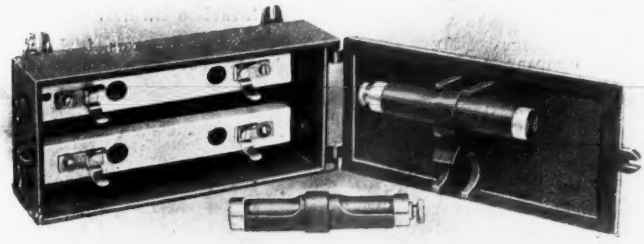


Fig. 1.—"M.P." Ironclad Combined Switch and Fuse.

Fig. 2 shows an iron-cased distributing box, fitted with the firm's special enclosed renewable fuse-holders, somewhat similar to the foregoing. Each pole is mounted upon a separate enamelled slate base, with a dividing fillet, and insulated from the teak battens with strong insulators. The door is glazed with stout plate glass, and, if desired, is fitted with a lock.

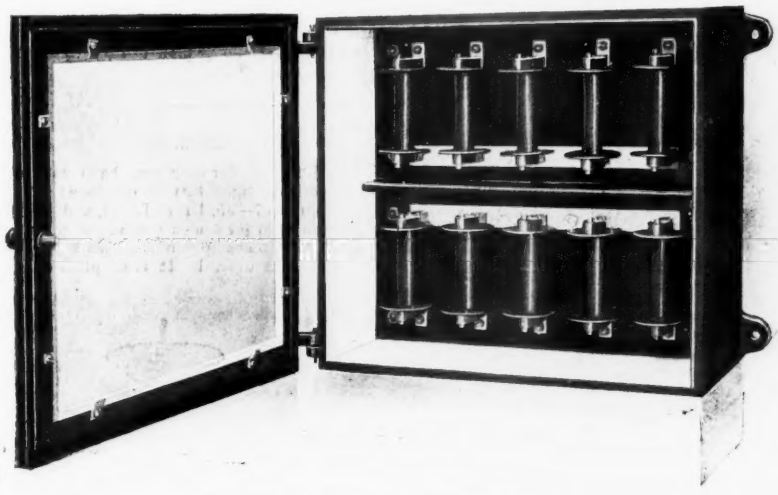


Fig. 2.—Iron-cased Distributing Boxes.

Messrs. Marryat & Place have also introduced many detail improvements in their "M.P." ironclad switches—a type which they claim to have originated. These switches have a long and quick break, cannot be left in intermediate positions, and are so designed as to be practically dust-proof. They are manufactured in large quantities by special machine tools.

Patent Travelling Lights and Stretching Pendants.

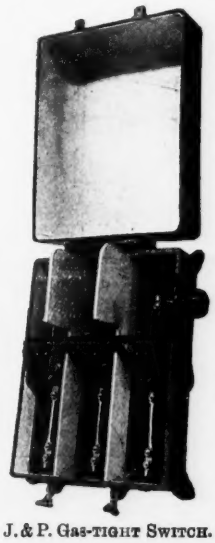
Messrs. Laurie's travelling light possesses most of the convenience of an ordinary portable lamp, without its disadvantages. The flexible is neatly looped up on bobbins, beginning with a ceiling rose, and terminating with a holder for the insertion of various special pendants. The flexible gathered up is slipped on a tight steel wire, and as the pendant is moved along, the loops gradually unfold themselves until the whole length is reached. Thus a travelling light can extend from its starting point to almost any convenient length, and without the inconvenience of loose flexible lying about the floor.

In conjunction with the travelling light, the makers have a number of special pendants, among which is their patent stretching pendant (illustrated herewith). This pendant consists of flexible wound spirally round a laminated-rubber core, which yields to any pull put on it, and should the lamp hang, say, 5 ft. from the floor, it can be grasped in the hand and stretched to the floor, if necessary, with the greatest ease. This arrangement has met with much approval, as it enables the user not only to walk along with his lamp, but to reach any particular shelf or out-of-the-way corner, as desired. The device, which is now much used in large warehouses, not only proves very handy, but at the same time reduces the number of lamps installed, and decreases the cost of lighting.

Laurie & Inglefield's Patent Stretching Pendant.

These apparatus, which are patented at home and abroad, are manufactured by Messrs. Thomas Laurie & Co., West End, Falkirk, N.B.

Gas-tight Switches.



J. & P. Gas-tight Switch.

These switches, which are supplied by Messrs. Johnson & Phillips, of Old Charlton, are of the triple-pole quick-break knife pattern, designed to break 50 amperes at 750 volts, and provided with fuse terminals. Each pole is mounted on a separate enamelled slate base, the bases being separated from each other by means of stout insulating non-inflammable fillets. The fuses are of the standard terminal type, the fuse wire being clamped between stout gun-metal blocks and enclosed in asbestos tubes. A stout iron cross-bar holds the three poles of the switch rigidly in position. The switch and fuse are fitted into a cast-iron box lined with asbestos throughout, and having a hinged cover. When closed, the cover is secured by means of two fly-bolts and nuts, a rubber joint making the entire switch gas and watertight. The handle for operating the switch is fixed on the outside of the case, the spindle being taken through a suitable stuffing box and connected to the insulated crossbar mentioned above. Highly insulating and practically unbreakable material is employed in the construction of the switch handle, thus ensuring that the switch is doubly insulated from the operator. The cables are taken through insulated stuffing boxes to suitable cable thimbles clamped on heavy gun-metal terminal blocks mounted on the front of the slate. The cast-iron case is provided with holding-down lugs

Commutator Grinder.

Since we had occasion, in 1901, to notice the patent commutator grinder brought out by Messrs. Phillips, of St. George's House, 6 and 8, Eastcheap, E.C., great improvements have been made in its design, and it has attained a high position in the estimation of the leading electricians in this country and abroad. Practical experience has shown the inventors the necessity of exercising the greatest care in the construction of the machine; the bearings have been made longer, the slides stronger, and all the gear wheels are cut out of solid steel, to ensure perfect rigidity when running at the very high speed required to produce a good and true ground surface.

The machines have been taken up by most of the makers of large dynamos, who have placed many repeat orders with the company, and they have been adopted at many of the largest electric light and power stations. The machines are also to be found on board

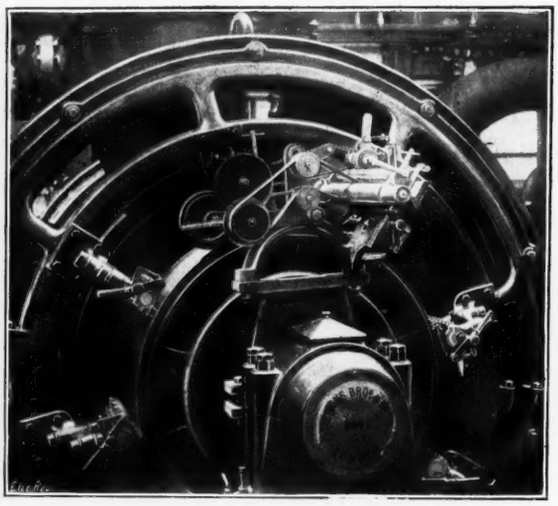


Fig. 1.—Commutator Grinder in Position.

British war ships. The largest commutator so far dealt with is one 8 ft. in diameter, in Calcutta—built by Messrs. Dick, Kerr & Co., Ltd.; the method of fixing the machine for use is shown in the accompanying figures. A similar equipment is on order for use in Santiago for still larger dynamos.

Fig. 1 shows a machine supported by a casting clamped round the nose of the bearing; the frame of the machine is bolted to a platform on the top of the casting. Some dynamo makers are turning the nose of the bearings parallel to suit this arrangement.

Fig. 2 shows how the machine can be carried by cantilevers bolted to the yoke of a dynamo with an 8-ft. commutator.

Other arrangements are made where the ends of the bearings are tapered, and where it is desired that the same machine shall be available for a mixed assortment of dynamos, considerable ingenuity being manifested in meeting the various conditions.

The larger machines have automatic traverse, but the smaller sizes have hand feed. Special forms are supplied for use on board ship, where space is confined, and for use in truing up the commutators of armatures while they are run in V blocks on a lathe. The machines are in every case driven by a friction wheel on the commutator, and the automatic traverse machines are provided with reversing gear, and adjustable stops, so that when the machine is set and started, the attendant has nothing to do but to watch the emery wheel travel to and fro on the commutator.

The syndicate formed to work this invention has now been merged in the Phillips Commutator Grinder Co., Ltd.

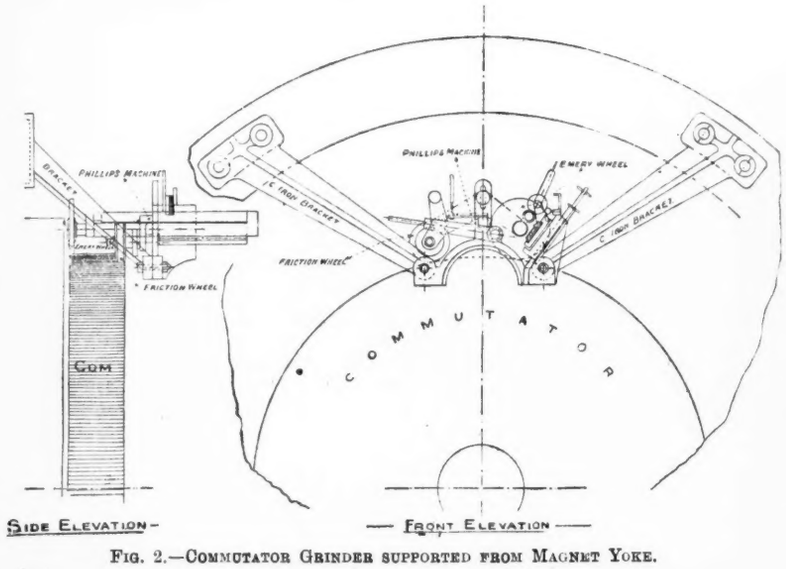


Fig. 2.—Commutator Grinder supported from Magnet Yoke.

Litholite Bushes.

Messrs Hunt & Hess, the manufacturers of "Litholite," of 3, The Grove, Hackney, N.E., have got out a line of tube-end screwed

bushes, as illustrated herewith. The use of these bushes with steel conduits for interior wiring needs no explanation; they are made in sizes from ½ in. to 2 in. in diameter.

Evered's Fittings.

Messrs. Evered & Co., Ltd., of Birmingham, have as usual a very fine assortment of electric light fittings displayed at their spacious showrooms in London (27—35, Drury Lane), and a number of new designs specially prepared for the current season are noticeable here and there. We show two examples of their work, one a very fine lantern measuring 36 inches overall. It is supplied either in

An Evered Electric Lantern.

polished brass, copper antique, or silver antique, and has white muffled glass. The other, which appears on the next page, is an electrolier, with three drop lights and a centre light, made in polished brass or silver antique. Messrs. Evered have a great variety of electric

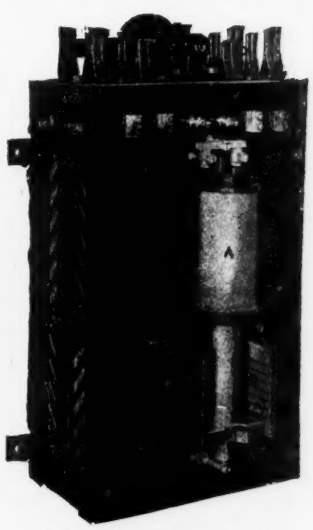
candle fittings, brackets, floor and table standards, old style lanterns, &c., shown off very effectively in a separate room where customers may select the designs which they regard as most in harmony with the general character of their house decorations. In the

An Evered Electrolier.

general showroom overhead there is a host of pendants, electroliers, billiard table lighting fittings, coronas and so on. Plainer work and shop lighting fittings are also in evidence, while there is a commanding showcase with a fine array of French and antique styles in bronzes, &c.

Electric Lift Controllers.

Messrs. Geipel & Lange, of Victoria Street, S.W., are supplying a standard reversible controller for goods and passenger lifts. It is shown in the accompanying figure, and is made in sizes from 5 H.P.



Electric Lift Controller.

upwards. The reversing switch is designed to be operated by a sprocket and chain, or other suitable means. All parts of the switch which carry current are made of hard-drawn copper of ample carrying capacity. The switch-blades and jaws are made interchangeable, and can be removed by loosening one screw. The switch is claimed to be very positive in making and breaking contact, cannot be left partly closed or opened, and will not burn or pit on the blades or jaws. The contacts are of copper, and by taking out two screws it is possible to remove the whole set for trueing or renewal. These contacts are placed at right angles with the face of the controller, and the brushes travel upward between them—an arrangement by means of which perfect alignment for the brush-holders, and perfect contact of the brushes, are assured. Upon closing the switch, the plunger, to which the brush-holders are attached, is attracted by a solenoid, and a dashpot serves to impart a slow and steady motion to the brushes as they travel upward to cut out the resistance. The full resistance is inserted in the armature circuit upon failure of the current supply. The firm has a list in circulation showing detailed drawings of the working of the arrangement, and also describing controllers for use with passenger elevators.

A Series of Fuses and Switches.

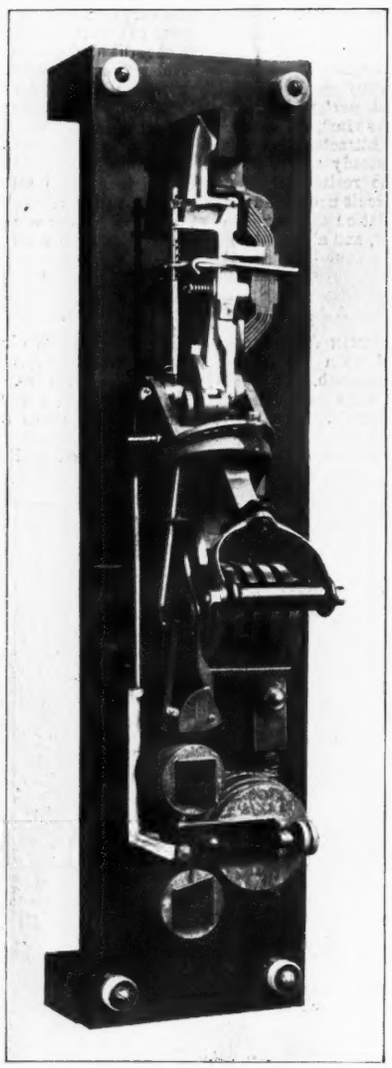
Messrs. Dorman & Smith, of Ordsal Electrical Works, Salford, have placed upon the market several improved fuses which we illustrate herewith. The patent "Baffle" service fuse for house supply has some new features, and is one of the safest forms of service fuse made. The D.P. fuses are in separate compartments of the iron case, and only one pole is accessible at a time. When one lid is opened the other is locked in the closed position by the

Patent "Baffle" Service Fuse.

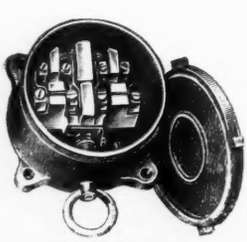
Dorman & Smith patent interlocking device, an extremely simple and ingenious arrangement. Each fuse is completely enclosed in a porcelain chamber, of which the covering half is fastened to the lid, and the lower half to the box. The fuse wire with its wedge contacts is entirely disconnected from the terminal jaws when the lid is opened, and in this position it can be quite safely renewed. The chief feature of safety, however, is the "Baffle" device by which the live terminals are cut off from the fusible wire or strip. It is formed by a partition in the porcelain, furnished with an asbestos pad over which the fusible wire is squeezed, something like the well-known Dorman & Smith "Damper" fuses, thus rendering an arc to the live terminal an impossibility. The conductors pass from the terminal box to the fuse boxes through fibre tubes. Messrs. Dorman & Smith have also introduced a series of replacement fuses which they have called their "Thumb" type, to distinguish them from their "Handle" series, previously described in the Electrical Review. They are for currents up to 50 amps. at 500 volts, and are of very substantial construction.

A smaller fuse is the "Well" type, having an open but protected and very easily renewable fuse wire, made in one size only, for 3 amps. up to 250 volts. This has been made interchangeable with

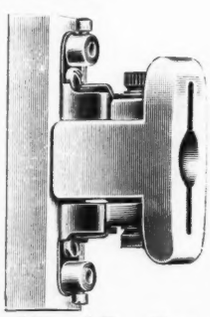
the ¾-in. size of "Damper" fuse, and is used in the firm's standard distribution boxes when replacement fuses with visible fuse wires are required. This firm has also extended its series of sliding



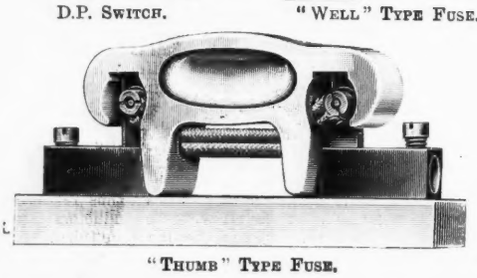
Grip Contact Circuit Breaker.



D.P. Switch.



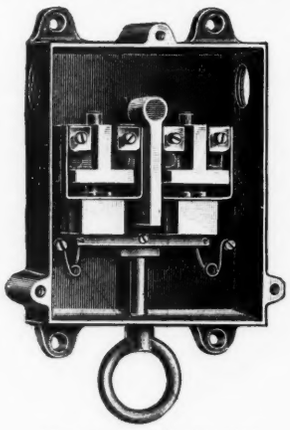
"Well" Type Fuse.



"Thumb" Type Fuse.

switches in iron cases for outdoor work by stocking a circular-cased double-pole switch for incandescent lighting, having a screwed-on lid; and also a larger double-pole iron-cased switch carrying up to 12 amps., for heavy arc lighting work or out-door motors of this size. All these sliding switches have substantial contacts mounted on porcelain, and are actuated from the outside by ring handles.

The well-known patent "Grip Contact" circuit breakers made by Messrs. Dorman & Smith, are being very extensively used for power work. One of the strong features of these circuit breakers is the



12-ampere D.P. Switch.

absolute reliability of the actuating device, particularly the device used for opening the switch on a reverse current. Another feature which commends itself to engineers is the compact manner in which various combinations of controlling gears can each separately actuate the grip contact switch. One of these combined forms we illustrate herewith.

A special form of reverse-current actuating gear has recently been produced for controlling generators and batteries on traction and lighting supply. In power stations, where a compound generator is required to be run in parallel with a battery, the surge of current in the incoming machine at the moment of switching-in is bound to open a reverse current circuit-breaker if the controlling gear is set to open with a very small reversal. It is, therefore, desirable that the reverse current actuating device on the circuit-breaker should be set to open at not less than 25 per cent. of the normal output in amperes. Under these conditions, if one reversed generator, running as a shunt machine, with the compound winding cut out, is switched in with one already running direct on the lighting bus-bars, the drop in volts at the moment of making contact may result in a big rise of current being passed before the switch will open. The difficulty of securing the first condition and avoiding the second defect has been overcome by the addition of a specially proportioned compensating winding. A reverse-current circuit-breaker so made, if set to open at 25 per cent. reverse current at its full voltage, will open at practically the same current at all voltages down to one-fifth of the full bus-bar voltage. These circuit-breakers should interest all station engineers, more particularly those who use batteries at their stations.

Electric Heating and Cooking Apparatus.

Messrs. Isenthal & Co., of 85, Mortimer Street, W., have added many novelties to their well-known series of electrically-heated appliances; a selection from these is illustrated and described below. The "Electra" heating units are used in various forms. Radiators are now made consisting of as many as 20 elements, and

Fig. 1.—Radiator for Ship's Cabin.

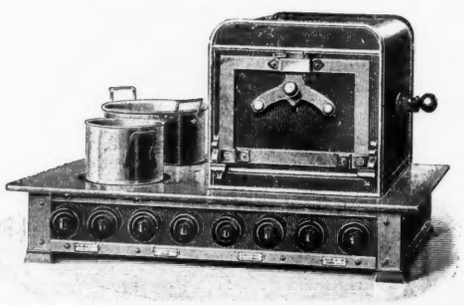


Fig. 2.—Table Range.

consuming a maximum of 12 kw. for heating large rooms in factories, &c.; a new line specially adapted for use on board ship has been designed, of which fig. 1 shows one of the simplest forms, suitable for fixing to the floor or bulkhead. Fig. 2 shows a neat

table range, containing two cooking plates and the oven, and capable of cooking for four or five persons; similar small ranges are made for use on ships, with sunken cooking plates to keep the pans in place, and ranges large enough for hotels, consuming at the maximum over 17 KW., can also be had. Fig. 3 illustrates a large roasting double oven, each compartment measuring 32 × 24 × 10 in., and consuming up to 3·5 KW. Bakers' ovens capable of baking 17 cwt. of bread per diem, with a consumption of 14 KW., have already been built in many places. A large steriliser for superheated steam, for sterilising towels, bandages, &c., is illustrated in fig. 4; this apparatus stands 70 in. high and weighs 2½ cwt. The water contained in a tank at the bottom is converted into steam by an evaporator, and as the steam rises past a heater it is superheated to 120°—150° C., without rising in pressure. Lastly, in fig. 5 we have an electric melting pot—one of a large number of apparatus specially designed for technical purposes. This is capable of melting up to 7 lbs. at one charge of soft metal such as solder, type-metal, &c., with a consumption of 0·15 to 0·4 KW.

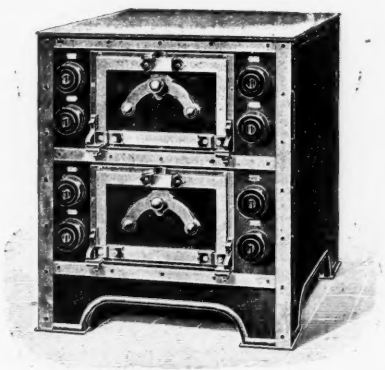


FIG. 3.—DOUBLE OVEN.

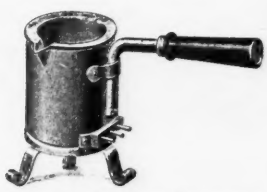
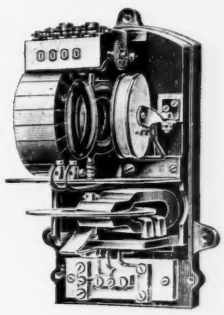


FIG. 5.—ELECTRIC MELTING POT.



ECLIPSE WATT-HOUR METER.

FIG. 4.—STERILISER.

A CHEAP LINE OF FITTINGS (BRAULIK).

The extreme convenience, cleanliness, and controllability of electrically-heated appliances are too obvious to need emphasising; we are especially pleased with the inference, from the large variety of such now made, that there must necessarily exist a general demand for them—otherwise they would not be in existence. No one who has not carefully examined a stock such as that of Messrs. Isenthal can possibly realise the growing importance and popularity of this branch of the industry.

The Eclipse Watt-Hour Meter, &c.

THE above-named meter has been introduced with considerable success both in this country and abroad by MR. GEORGE BRAULIK, of 217 and 218, Upper Thames Street, E.C. It is reasonable in price and will register accurately small amounts of energy. Our illustration shows the interior of the meter, the principal parts being a main current coil, a starting coil, a rotating armature, brush terminals, brake disk, permanent magnet, revolution counter, and three terminals, while in series with the armature and the starting coil is a high resistance. The armature is of the open coil type, and consists of three oval coils, one end of each being connected together, while the three remaining ends are joined respectively to the three segments of a three-part commutator. By this arrangement the possibilities of breakdown at the points where the coils are connected to the armature are reduced to three, while the commutator only having three segments, its diameter is reduced to a minimum, and commutator friction substantially reduced. Sparking is avoided by means of a patent arrangement. The full shunt current in the open-coil armature flows through the whole winding, while, with the drum type, the two halves are in parallel, and therefore only half the current flows through each coil, consequently, other things being equal, it is stated that the armature moving force is increased, and its weight reduced in this meter as the copper is used to greater advantage. A very small shunt current is required, being only about 0·022 ampere. The meter commences to register at rather less than 1 per cent. of full load, and being a true energy meter, can be used with equal advantage for direct or alternating current of any frequency, and on either non-inductive or inductive circuits, the self-induction of the armature being very small compared to its resistance. There is an entire absence of "creeping" with this meter.

With a meter of 10-ampere capacity on a circuit of 220 volts, the shunt current taken was 0·021 ampere, while the starting current was 0·065 ampere, the drop across the meter at full load being 1 volt. The working parts are entirely free from iron, and therefore the driving torque and the speed of rotation of the armature are proportional to the watts expended in the circuit, as the number of revolutions is also a measure of the energy used. The armature is connected to the revolution counter through a train of wheels, which causes the register to be given in plain figures automatically, and in B. of T. units, thus entirely avoiding the possibility of reading errors. This is of particular importance to the consumer, who is thus enabled to read his own meter without difficulty, although if preferred, the ordinary clock dial recording gear can be supplied. The field of this meter is produced by one main coil instead of two, but equal accuracy is claimed with the addition that the watts lost have been substantially reduced.

The meter above described is suitable for two and three-wire circuits up to 600 volts. For capacities of more than 25 amperes, however, a double coil meter of larger size, but practically the same design, is supplied, to which the foregoing remarks will equally well apply. On the occasion of a recent visit to Mr. Braulik's showroom in Upper Thames Street, we were shown several very serviceable lines

Arc Lamp, Type E.G.

in fittings of the cheaper styles, and one of the newest of these is shown herewith. There is a variety of neat lanterns, pendants, measuring instruments, arc lamps, and so on, on view.

The firm are well to the fore in arc lamp work, and are placing on the market a special line of miniature arc lamps for direct current only. These lamps are substantially built, and the working parts are as durable as those of the larger types of arc lamps. Type E.G. (see figure) is built for 18 hours' burning, the current consumption being 1½ to 2 amperes, and the lamp is only 15 in. overall. A similar lamp, to burn 30 hours, measures 18 in. overall, and consumes 3 to 4 amperes of current.

Stage Arc Lighting Novelties.

Messrs. Wharam & Borland, of the Grove Engineering Works, Leeds, are specialising in, amongst other things, arc lighting

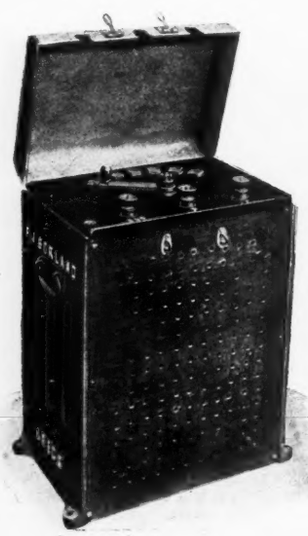


Fig. 1.

Fig. 2.

apparatus adapted for theatrical, photographic, and scientific purposes. We illustrate in fig. 3 a cinematograph lamp, by this firm, designed sufficiently substantially for 100 amperes continuously. It is provided with heavy terminals and carbon clamps, has horizontal and vertical adjustments, worm-feed wheel and worm carbon tilter. The firm also supply a special box-type resistance (fig. 1) for use in connection with the cinematograph lamp. This is strongly constructed and amply ventilated, the coils being connected to a switch on the slate top. Six multiple contacts are provided, also three terminals, one connected direct to the switch, and the other two arranged for 120 or 250-volt circuit connections. In the Simplex photographic lamp, fig. 2, the firm are introducing an efficient and reliable apparatus at a low cost. The diffuser is an ordinary type umbrella, mounted in a socket, and it may be closed and removed when not in use. The source of light

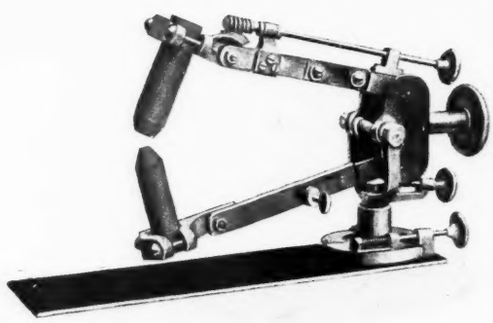


Fig. 3

is two hand-feed arc lamps, mounted in a special reflector which may be tilted in any required direction. The apparatus is exceedingly light and portable, the whole only weighing 32 lbs. A large variety of search lights, lanterns, projectors, footlights, resistances, chokers, switches, and kindred apparatus, are included among the firm's specialities.

Ironclad Switch.

We illustrate below the patent A.B. ironclad switch of the Sunbeam Lamp Co., Ltd. It is specially intended for use with motors in factories, shops, warehouses, &c., where more or less rough usage is unavoidable. A long quick break is obtained with this switch; the

A.B. Ironclad Switch.

poles are mounted on separate enamelled slate bases divided by an insulating fillet. Among the leading points are the front connections as shown, also the leading-in holes, which are bushed or drilled for iron pipes as may be required.

Messrs. Archibald J. Wright, Ltd., of 318, Upper Street, N., have in circulation a list of some of their small electric novelties of the popular order such as pocket flash lamps, electric pins, small clocks, hand lamps, model electric railways, medical coils and so forth. Their new flash lamps with sliding covers are a useful line for contractors and wiremen who are either working or inspecting in dark and awkward corners.

Messrs. Ernest F. Moy, Ltd., of Camden Town, are supplying some special supports for stage arc lamps. One is a convenient form of bracket for fixing a stage lantern to the proscenium wall; another is a useful type of stage arc lamp stand fitted with split clips and a weldless steel tube, which slides easily through the clip and can be securely clamped in any position by a locking handle. A list has been issued by the firm showing these stands.

Outdoor and Theatre Lighting.

The Imperial Lighting Co., of 13, Gate Street, Holborn, W.C., have introduced a number of new specialities, of which the following are a selection:—Fig. 1 shows an improved self-locking arc lamp winch with detachable handle. It is impossible for the lamp to be lowered without first inserting the handle. This winch is made in two sizes, No. 1 for large lamps and high lift, No. 2 for enclosed or light lamps with sign work. Figs. 5 and 6 refer to the Imperial Lighting Co.'s new "Fireproof" theatre fittings (registered design). They have equipped nine theatres in 12 consecutive months, which they claim to be a record achievement. These fittings are made throughout of mild steel, and are, consequently, very light, yet very strong. Two men can lift a 32-ft. batten by the extreme ends, and there is no sag. All the wires are protected by steel, but insulated from it, and can be exposed in five minutes, if necessary. There is no "looping in," or T jointing, with all their attendant troubles. Only the lamps are on the reflector side, and, therefore, a very large reflecting surface is effective. These lamps can be arranged in one, two, three or four rows.

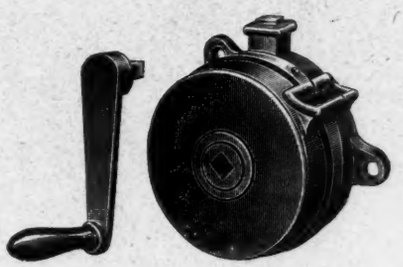


Fig. 1.—Self-locking Winch.

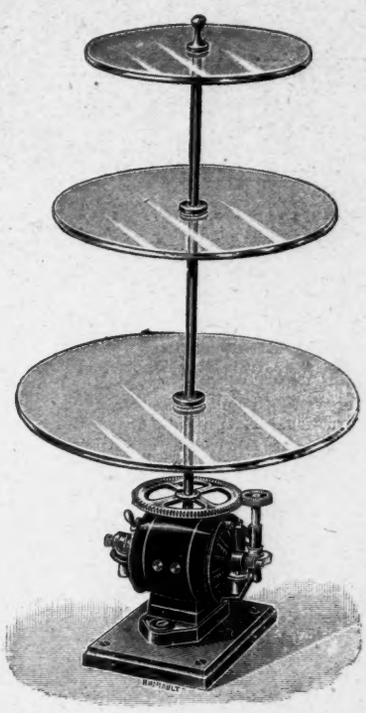


Fig. 2.—Motor-driven Turn-table.

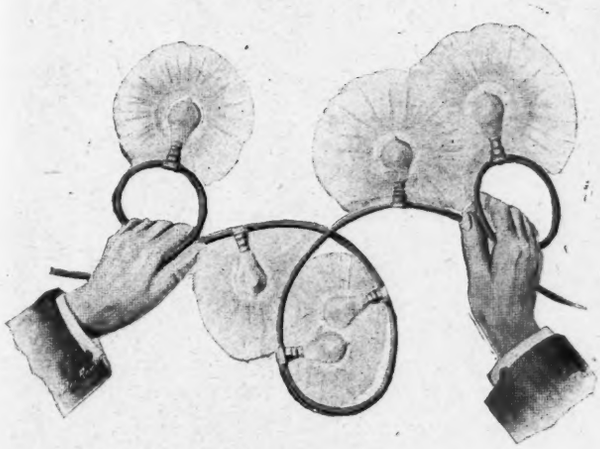


Fig. 3.—"Fairyland" Strip for Illuminations.

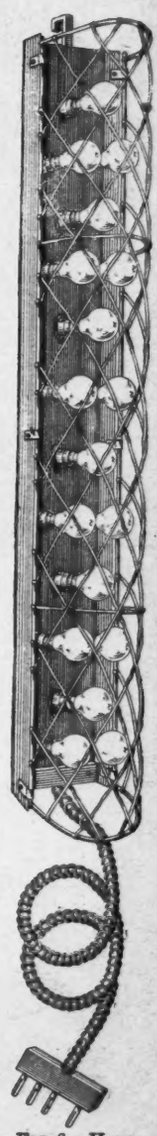


Fig. 6.—Hanging Length with Three Rows of Lamps.

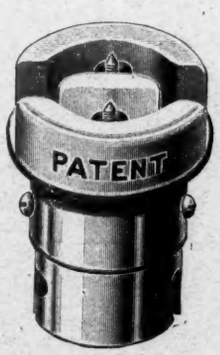


Fig. 4.—Waterproof Lampholder.

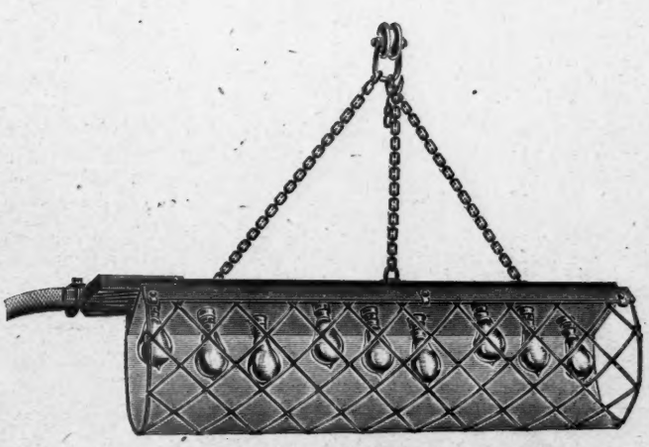


Fig. 5.—Batten with Three Rows of Lamps.

This system is called the "Imperial," and is claimed as the safest, surest, and cheapest yet devised. The company supply everything for the stage, from floats and battens, to plug-boxes and main switch-boards.

a lift of 18 ft. The device is compact and very strong. Fig. 2 shows an electric turntable suitable for any voltage up to 250; the table is supported on a ball bearing, and requires about 60 watts to drive it. Fig. 3 illustrates the flexible "Fairyland" strip, with which the company are illuminating a central station in Yorkshire, while recent installations have been Lowestoft Pier, Folkestone Bandstand, Swansea (King's visit), 4,000 lamps; Minehead, Cardiff, &c. The waterproof holders shown in fig. 4 are being used extensively for

New Tumbler Switches.

Messrs. Sperryn & Co., Ltd., of Hospital Street Works, Birmingham, have just brought out two new patented types of switches for which special advantages are claimed. Of these, fig. 1 shows a

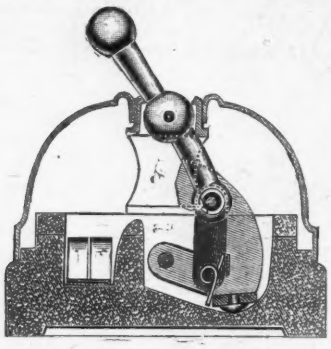


Fig. 1.—25-Ampere Tumbler Switch.

tumbler switch for a maximum current of 25 amperes; this switch is 4 in. in diameter × 4 in. high, and is actuated by a perfectly certain link action, which is assisted by (but not dependent upon) a strong spring. There are no metallic parts at the back whatsoever, the terminal blocks are completely isolated and concealed, and the break is very long and quick. Even when the cover is off, the terminal blocks are inaccessible. All the parts are of very substantial construction, and the action of the sample before us is perfect.

Fig. 2 shows the other type—a two-way tumbler switch, of very simple and strong construction. The principle of the mechanism is

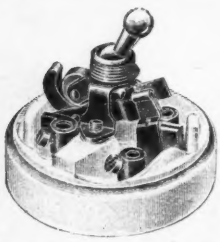


Fig. 2.—Two-Way Tumbler Switch.

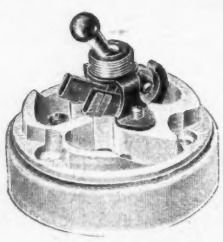


Fig. 3.—Ordinary Tumbler Switch.

the same as that of the ordinary "Sperrynwood" tumbler switch (fig. 3) in which many improvements have been made, and it is claimed that these switches excel in compact and neat design, sure contact and long break, and smoothness in working.

Messrs. Sperryn & Co.'s lampholders, fuses and distribution boards are well known to our readers, and have already been favourably commented on in our pages.

Ironclad Switches and Fuses.

Messrs. Parmiter, Hope & Co., of Hulme Electrical Works, Manchester, have designed a patent watertight and gastight gate box switch for collieries. This switch (fig. 1) consists of two S.P. H-type

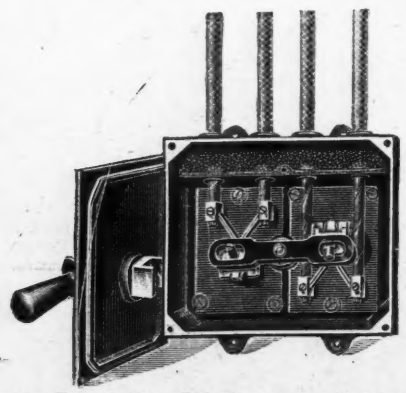


Fig. 1.—Patent Gate Box Switch for Collieries.

switches of the "Link" pattern enclosed in a cast-iron case, specially constructed for colliery use, and arranged with their "Patent Reverse Motion" turn handle. The cables are sealed in a patent combined sealing trough, and the handle is passed through a stuffing box packed with asbestos cord. The company has also given special attention to ironclad distribution switches and fuse boxes, and now stocks all sizes of D.P. fuses in a standard pattern ironclad case with glass front, as illustrated in fig. 2, as well as a complete range of S.P. fuses in ironclad cases for lighting and motor circuits, and for house service fuse boxes (fig. 3). A special department is engaged in the sole manufacture of distribution fuse boxes.

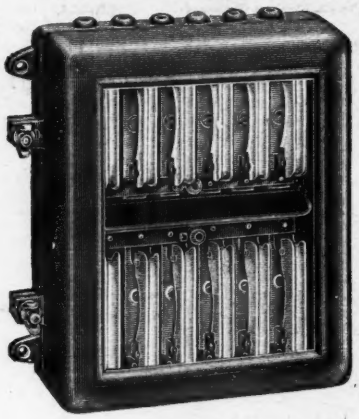


Fig. 2.—Ironclad Distribution Box.

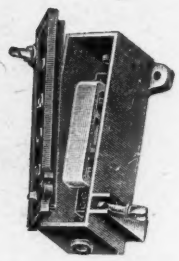
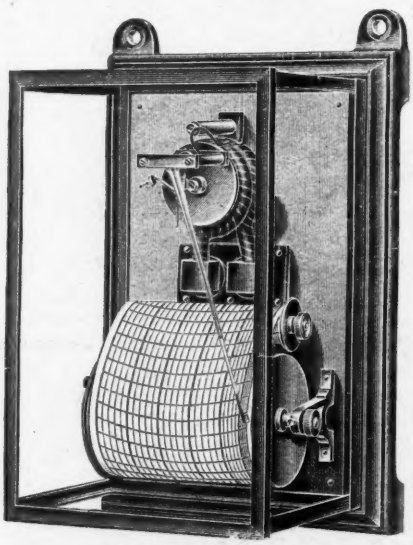


Fig. 3.—Ironclad Fuses for Motor Circuits.

The company has also a new line of enclosed and midget arc lamps, the latter being an exact facsimile of the firm's single enclosed lamp on a smaller scale.

New Recording Instrument.

This instrument has been designed by Messrs. Cecil Hodges and Co., of Balfour House, E.C., for traction work, and where great fluctuations in the current take place. The instrument, which is shown below, is fitted with an air damping chamber, and the chart



Recording Ammeter.

runs on two drums, so that a month's record can be obtained without altering the instrument. The firm are making a special feature of instrument and switchboard work, and this instrument and their knife switch, shown elsewhere in this issue, are only two examples of many improvements that they are carrying out in this class of work.

Maxim Electric Lighting Specialities.

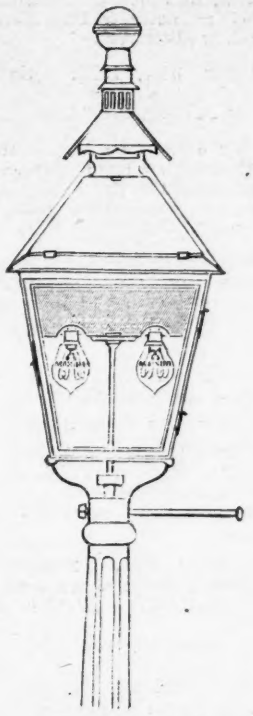
The Sir Hiram Maxim Electrical and Engineering Co. have added to their arc lamp lists several new and interesting particulars regarding the "Maxim" enclosed arc lamps. The power circuit lamp, which has self-contained line and substitutional resistances, and automatic cut-out, has recently been equipped with a self-contained isolating switch which enables one lamp to be attended to for trimming, &c., while the remainder of the series are alight. The switch is manipulated by a key which is inserted through a lifting door in the case, the lamp retaining the same appearance as the ordinary power circuit lamp.

By increasing the standard alternating current lamp only 1 in., making an overall length of 25 in., the burning time has been increased 33 per cent. The lengths of carbon used are 12 in. top and 6 in. bottom. These lamps, which have self-contained choking coils, enabling them to be connected direct to the mains, are made to burn quite noiselessly and steadily by an ingenious arrangement of springs. Further additions include a new midget arc lamp of exceptional sensitiveness and efficiency, and several new fittings for

the standard lamps, comprising inner and outer globes, oblique reflectors, ornamental fittings, &c.

By means of the Maxim patent holder, a shade, when once screwed up, can be removed in exactly the same manner as the lamp is taken out, simply by unhooking from the bayonet joint; the risk of breakage by removing or screwing up the shade is thus avoided. The large demand for these holders has led the Maxim Co. to put down special plant for their manufacture in large quantities, and consequently at greatly reduced prices.

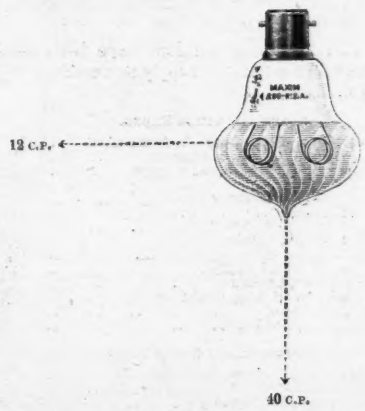
The Marvel Lamp, which is a registered design, is claimed to be very economical, as the light is reflected in the direction most wanted for use. Further, the glare of the incandescent filament is



KING'S WAY LANTERN.

said to be entirely broken up by the glass ribs upon the bottom of the bulb.

Hitherto the company has not carried a large stock of Maxim high-voltage lamps, but the necessary plant has now been laid down, and during the coming season large supplies will be stocked.

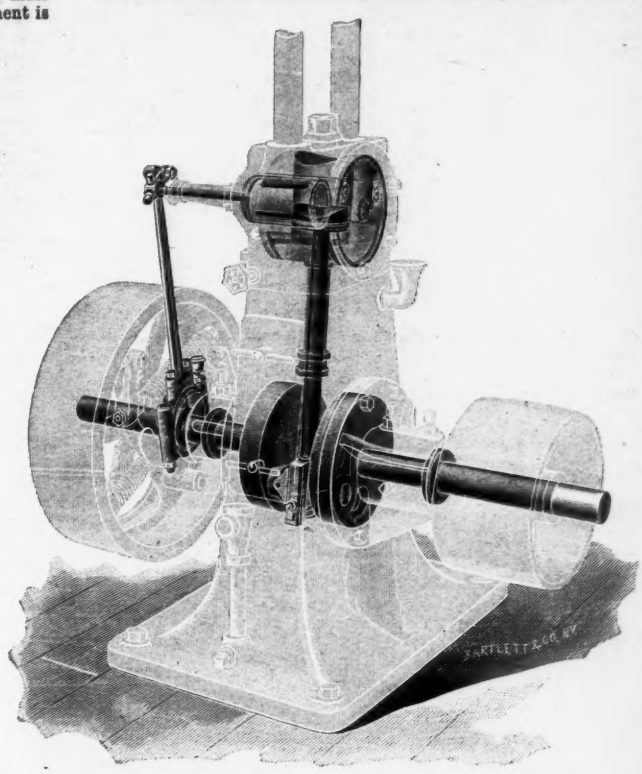


"MARVEL" LAMP.

The King's Way Lantern, which is illustrated herewith, has been specially designed for converting the ordinary gas lantern for use with electric incandescent lamps. The lamps are hanging in the correct way, so that no shadows are thrown as when the lamps are placed the other way round. The reflectors are made in white enamelled iron, opal glass, and fluted silvered glass.

The Case Automatic High-Speed Engine.

MR. C. R. HEAP, of 47, Victoria Street, S.W., is the agent for this unique type of small engine, which hails from across the "pond," and has in its native land occupied a wide sphere of usefulness. It is manufactured in three main varieties—the pedestal type (as illustrated), the bracket type for fixing to walls, and the hanger type for fixing to an overhead beam. The method of operation of the engine is very simple. The piston moves up and down a cylinder, which itself is free to oscillate on a horizontal axis; this oscillation is produced through the motion imparted to the rigid piston-connecting rod during the rotation of the crank, and as the cylinder rocks it opens and closes steam and exhaust valves on its face. In order to reduce friction and wear, the cylinder is steam balanced, a small balancing chamber being hollowed out of the under side of the cylinder. The reciprocating parts of these engines (the piston and piston-connecting rod) weigh very little; thus in the 8-H.P. engine the amount is 12½ lbs., which is two-thirds counter-balanced by the crank. Speed regulation is



effected by means of a shaft governor, which is arranged to rotate the eccentric on the shaft, thus altering the "lead," but throttling governing can also be supplied. The crank chamber forms a reservoir for oil and water, efficiently lubricating the rotating parts, the cylinder being lubricated by a sight feed oiler. The engines are built in sizes of from 2·7 H.P. to 25 H.P., with speeds of from 900 to 550 revs. per minute, and a steam pressure of 80 lbs. per sq. in.

Pnumapant Compressed Air Apparatus.

MESSRS. WALLACH BROS., of 57, Gracechurch Street, E.C., have placed on the market their patent "Pnumapant" apparatus for painting and varnishing by means of spray, a method which is both

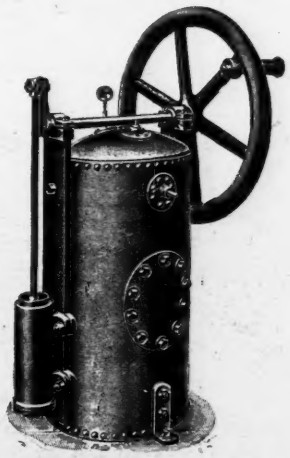


FIG. 1.—PORTABLE AIR COMPRESSOR AND TANK.

speedy and economical. The paint can be applied in coats of any thickness and is driven into every crevice, so that rough surfaces can be painted as easily as smooth. Apart from this, however,

the air compressor which forms part of the apparatus is available for blowing the dust out of the armatures of dynamos, cleaning switchboards, &c., and is thus doubly useful in electricity works. Fig. 1 shows the hand air-compressor and air tank, which is self-

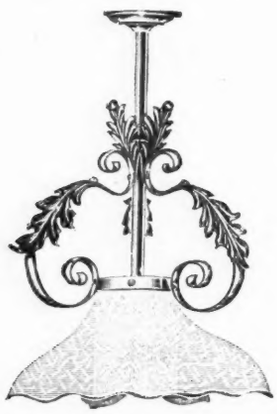
Fig. 2.—Sprayer.

contained and portable; the fly-wheel can be replaced by a pulley for power driving. A larger size is made for power driving only.

Fig. 2 shows the sprayer which is used for painting, &c., and is fitted with a trigger controlling both air and paint supplies.

Brass Pendants.

The Kensington Stamping Co., Ltd., of Birmingham, have a very comprehensive line of pendants, from which we illustrate a sample. The patterns include fixed and movable pendants for various



numbers of lamps, and a selection of hand-made lanterns in copper, brass or oxidised silver. Many of these fittings are highly ornamental, with scroll and leaf work, and there are also included massive and plain examples of workmanship.

CONTRACTS OPEN AND CLOSED.

OPEN.

Carlisle.—November 1st. Two Lancashire boilers, two 50-kw. and one 30-kw. steam dynamos, 5-ton travelling crane, economiser, cables and boxes, wiring of buildings, switchboards, motors, fans, &c., for the Cumberland and Westmorland Lunatic Asylum. See "Official Notices" September 30th.

Dublin.—October 24th. Cast-iron troughing and covers for the Electricity Supply Department. City engineer, Mr. Spencer Harty, City Hall. Specifications, &c., 21s., refundable.

Erith.—November 11th. Electric lighting of the offices of the Erith Education Committee at Picardy. See "Official Notices" to-day.

London.—October 24th. L.C.C. stores for a year (electric fittings, cables, tubing, &c., are among the specified items). Particulars from County Hall, Spring Gardens, S.W. (send stamped foolscap envelope).

Middleton.—October 25th. Dust destructor, Lancashire boiler, superheater, piping, &c., for the Electricity Department. Particulars from Town Clerk (one guinea).

Northampton.—October 24th. Steam coal for the Corporation tramways. See "Official Notices" October 14th.

Preston. — November 9th. Motors and tramway boosters for the Tramways Committee. See "Official Notices" October 14th.

Richmond, Surrey.—October 27th. The Guardians invite tenders for the installation of electric telephones at the Union Workhouse, Grove Road, Richmond, in accordance with specifications prepared by their architect, Mr. Percy Umney, Clerk to the Guardians, Union Chambers, Richmond.

Shanghai. — March 31st, 1905. Construction and working of 24 miles of electric tramways on the trolley system, double or single. See "Official Notices" October 14th.

Spain.—November 6th. The Municipal Authorities of Liria (province of Valencia) are inviting tenders until November 6th for the concession for the electric lighting of the town. Particulars may be obtained from, and tenders are to be sent to, El Secretario del Ayuntamiento de Liria (Valencia).

Swansea.—November 12th. Removal, alteration and re-erection of a 450-i.h.p. triple-expansion engine and a 225-kw. continuous current dynamo. Also an 8-ton travelling hand-crane, for the Electricity Department. See "Official Notices" October 14th.

Tottenham.—October 21st. The U.D.C. is open to enter into negotiations with a company to exercise the powers under its E.L. prov. order. See "Official Notices" October 7th.

West Ham.—The Education Committee of the Corporation decided on Monday to obtain quotations for the supply of electric lamps of 8, 16 and 32-c.p., to be supplied in quantities of 1,000, and to be kept in store and sent out to the various schools as required.

Whitby. — November 21st. 200-kw. direct-current dynamo and high speed engine, also one water-tube boiler with chain grate stoker, for the U.D.C. See "Official Notices" to-day.

CLOSED.

Brush Contracts.—The Brush Electrical Engineering Co. has received the following contracts:—

For the Birmingham & Midland Tramways Co., 14 radial trucks with Brush motor equipments.

For the County of London Electrical Engineering Co., Ltd., five 25-kw. transformers.

Brussels.—Messrs. W. F. Jones & Co., of Cannon Street, E.C., have secured a contract from the Corporation for 500 ironclad three-wire house service fuse boxes.

London.—The following tenders have been received by the London County Council for the supply and erection of plant at the Greenwich power station:—

Steam and Other Piping.

John Spencer, Ltd., Wednesbury (recommended)	£9,785
The Stirling Boiler Co., Ltd., Motherwell	9,792
Mechan & Sons, Ltd., Glasgow and London	9,884
S. Russell & Sons, Leicester	10,095
Foster Bros., Ltd., Wednesbury	10,145
Aiton & Co., London	10,530
Thos. Piggott & Co., Ltd., Birmingham	10,559
Edward Le Bas & Co., London	10,592
Westwood & Wrights, Brierley Hill, Staffs.	10,801
John Musgrave & Sons, Ltd., Bolton	11,242
Thos. Potter & Sons, London	11,247
Hefford & Shuttlewood, Ltd., Leicester	11,513
J. G. Moore, Hartlepool	11,940
John Fraser & Son, London	15,468

Condenser and Other Piping.

James Oakes & Co., Alfreton (recommended)	£6,418
Sir Hiram Maxim Electrical Engineering Co.	6,486
John Spencer, Ltd., Wednesbury	6,725
Aiton & Co., London	6,910
The Holwell Iron Co., Ltd., Melton Mowbray	6,974
John Musgrave & Sons, Ltd., London	7,365
Edward Le Bas & Co., London	7,430
The Sheepbridge Coal & Iron Co., Chesterfield	8,014
Westwood & Wrights, Brierley Hill, Staffordshire	8,473
Clayton, Goodfellow & Co., Ltd., Blackburn	11,668

Pumps, Motors and Strainers.

Electric Construction Co., Ltd. (recommended)	£8,083
John Cochrane, Barrhead, Glasgow	8,500
Gwynnes, Ltd., London	8,575
Entwisle and Gass, Ltd., Bolton	9,050
Do. Do.	9,105
Vickers, Sons & Maxim, Sheffield	9,071
Bruce Peebles & Co., Ltd., Edinburgh	9,795
W. H. Allen, Son & Co., Ltd., Bedford	9,800
British Westinghouse Co., Ltd.	9,807
Ernest Scott & Mountain, Ltd.	9,921
Johnson & Phillips, Ltd., London	10,228
The Electrical Co., Ltd., London	10,319
Andrew Barclay, Sons & Co., Ltd., Kilmarnock	10,500
John Thom, Patricroft, Lancs. (incomplete)	120
The Mirrlees Watson Co., Ltd. (incomplete)	652

Car Traversers for New Cross and Camberwell.

C. & A. Musker (1901), Ltd., Liverpool (recommended)	£1,456	10	0
Jessop & Appleby Brothers, Ltd., Leicester	1,534	6	6
Hurst, Nelson & Co., Ltd., Motherwell	1,646	8	0
Ransomes & Rapier, Ltd., London	1,765	10	0
Do. Do.	2,005	10	0
John Hitchin & Son, Ltd., Halifax	1,778	15	0
Do. Do.	1,885	15	0
Dick, Kerr & Co., Ltd., London	1,828	4	0
Brush Electrical Engineering Co., Ltd.	1,850	0	0
Heenan & Froude, Ltd., Worcester	1,872	3	0
Robert W. Blackwell & Co., Ltd., London	1,950	0	0
Cowans, Sheldon & Co., Ltd., Carlisle	1,955	0	0
James Buchanan & Son, Liverpool	2,299	11	6
John M. Henderson & Co., Aberdeen	2,403	0	0

Hereford.—The T.C. has accepted the tender of the India-Rubber, Gutta-Percha & Telegraph Works Co., Ltd., of Silvertown, for the supply of a spare armature, for a circulating pump to condenser, and for 24 service boxes and service clips.

Watford.—The U.D.C. has accepted the tender of Messrs. Clifford & Gough, for additions to the E L. works, at £3,744.

Whitehaven.—The T.C. has accepted the tender of the British Insulated and Helsby Cables, Ltd., for the supply of cable for lighting the harbour, and that of the Gilbert Arc Lamp Co. for arc lamps.

FORTHCOMING EVENTS.

Friday, October 21st.—At 7.30 p.m. North-East Coast Institution of Engineers and Shipbuilders. Twenty-first annual general meeting at Newcastle. Presidential address.

Manchester Students' Section of the I.E.E. Visit to the British Westinghouse Works at Trafford Park.

Saturday, October 22nd.—At 2 p m. North-East Coast Institution of Engineers and Shipbuilders (Graduates). Visit to the Newcastle-upon-Tyne Electric Supply Co.'s Carville power station and (at 7 p.m.) first general meeting at Newcastle.

Tuesday, October 25th.—At 8 p.m. Faraday Society. Meeting at the I.E.E. "Notes on a Suggested New Source of Aluminium," by Mr. B. Pool; "The Measurement of the Potential of the Electrodes in Stationary Liquids"; "The Determination of Changes of Concentration at the Cathode during Electrolysis," by Dr. H. I. S. Sand; "Electrolytic Oxidation of Hydro-carbons of the Benzene Series; Part I.—Hydrocarbons containing the Methyl Group," by Mr. H. D. Law and Mr. F. M. Perkin.

Friday, October 28th.—At 7 p.m. Institution of Electrical Engineers (Glasgow). Third annual dinner at the Grosvenor Restaurant.

At 5 p.m. Physical Society. "An Interference Apparatus for the Calibration of Extensometers," by Messrs. J. Morrow and E. L. Watkin, and other papers.

Saturday, October 29th. At 3 p.m. Junior Institution of Engineers. Visit to the National Physical Laboratory, Teddington.

At 7.30 p.m. Glasgow Technical College Scientific Society. "The Law of Workmen's Compensation," by Mr. W. Boyd Anderson.

NOTES.

Gas Again.—A serious gas fatality has occurred at Southport, and exemplifies the dangers of coal gas as used for an illuminant in bedrooms. From the facts brought to light at the inquest on the 13th inst., it appears that a little boy named John Arthur Fletcher, residing at 12, Chestnut Street, Southport, retired to rest with his sister aged 16. The following morning the father, a tinsmith, noticed a smell of gas, and found both girl and boy in bed unconscious. The boy, though medically attended, died without regaining consciousness, and the doctor, at the inquest, said the cause was poisoning by coal gas. The girl was for several days unconscious, and it was feared that she, too, would die. The jury at the inquest examined the gas bracket, and it was found that the tap would turn right round without any check. The father found the gas escaping when he went into the room, and the conclusion arrived at was that the girl must have turned out the light, and turned the cock a little too far, the result being that the gas would escape. A juryman stated that there were hundreds of such burners in Southport, and he believed many people had had to get out of bed to turn off the gas properly. We have a sort of suspicion that our gas lighting contemporaries, who are for ever decrying the good points which we claim for electric lighting, and are frantically trying to preserve some sort of a reputation for gas illumination, will keep silence regarding such accidents as this. Such facts should be placed on the bills of gas companies, side by side with the claims that gas is so much cheaper (and nastier ?) than electricity.

Board of Trade and the Third Rail Problem.—Our Southport correspondent writes:—"A few days ago a Birkdale resident wrote to the Board of Trade pointing out the danger to human life caused by the 'live' rail, and asking the Board to compel the directors of the line to safeguard human life. He urged the Board to remember that there would always be so-called trespassers, and that the death penalty was a very heavy one to pay for ignorance. He has received a reply from the President of the Board of Trade, who stated that the matter was receiving his consideration."

The Supply of Crude Oil.—Probably the general meeting of the "Shell" Transport Co. did not attract the attention of many of our readers, but to those who are interested in any way in the supply of crude, or refined petroleum, or its bye-products, the speech of Sir Marcus Samuel, the chairman, is of some interest. As oil fuel is coming into commoner use daily, and as not a few are deterred from installing the system in whatever form it may happen to present itself to them, from a somewhat natural feeling that the supply of oil will drop off, or the price be raised by speculators or monopolists beyond the economical limit, these people will be soothed by the chairman's statement that, although the average output of crude oil from the company's wells has been about 6,000 tons per week, it might have been twice this amount if the facilities for storing, transporting and treating the oil had been adequate. As it was, a well giving between 700 and 1,000 tons per day had to be shut down, and new wells could not be tapped for that reason.

Bitter complaint of the Burmese authorities is made, in that they have set up the Burma Oil Co. as monopolists in the Indian trade, or at least have made competition by the Shell Transport possible only on unequal terms. Indirectly we gather that the annual demand in India is 96 millions of gallons, say, 380,000 tons.

We do not know the Government side of the case, but, under ordinary circumstances, a refusal to grant prospecting licences, and threats to cancel licences issued to other prospectors if they were transferred to the Shell Transport, would be inexcusable. It is possible that the Government found itself unable to accept the company's statement that they were a British company, and were not allied with the Standard Oil Co.

Russian oil is a strong competitor at present, but the chairman thinks that the internal demand would be sufficient to keep the Russian wells busy if the high excise duty which Russia imposes "to keep her unhappy people in the ignorance caused by dear light" were removed.

Manufacturers and others who realise the advantages accruing to the use of liquid fuel, be it in furnaces or engines, but wait further news of the capacity of the world's store before sinking more capital, ought to be brought to understand that, notwithstanding the immense wastage which occurred when the American oil fields were opened, notwithstanding that the Beaumont fields alone had a capacity of 6 million barrels per diem in 1902, the world's output is making vast strides without any sign of exhaustion, and doubtless many fields remain to be discovered.

The real trouble British consumers have to face is the excessive rates charged by the railway companies on petroleum in bulk, and their refusal to differentiate between high and comparatively low-flash oils. Crude oil landed at Liverpool has its cost almost doubled on the journey, say, to Birmingham, although, from a traffic point of view, a 10 to 20-ton tank of oil having a flash point of over 200° is a load which cannot be surpassed for easy, rapid, economical and safe handling. Yet it is treated almost like an explosive. The consequence obviously is, that the chance of fuel oil competing with local coal is reduced to vanishing point as the distance from the seaboard increases.

Pipe-lines, pumps, and tank-steamers do all that can be done with present knowledge to cheapen the cost to our ports, then the railways step in and undo all that has been done to lessen the cost to the consumer.

The New York City Subway Opening.—A New York correspondent writes:—"The subway system is to be opened for public use on Thursday, October 27th. It was originally intended to spend a sum of £10,000 on the dedication ceremonies, which were to include prayers, speeches, music, decorations, dining and fireworks; but when the matter came before the Board of Aldermen, the proposed plans were repudiated, and it was suggested that a sum of £1,000 would suffice for the occasion. The aldermen who had fathered the original suggestions thereupon became annoyed, and refused to have anything to do with the spending of the reduced sum. It is probable, therefore, that the opening will be in an extremely simple manner, with a few congratulatory speeches, and the driving of the first train through the tunnel by the mayor, Col. George B. McClellan. The subway has been constructed at a cost of about £7,000,000 by the Interborough Rapid Transit Co., the money being loaned by the city, and the city having the option of taking over the property at the end of 50 years.

Wireless Telegraphy in War Time.—A Central News telegram states that the *Giornale di Roma* has been advised by cable from Chifu that the Japanese have intercepted a wireless message from General Stoessel to the Russian Consul at that place stating that Port Arthur's supply of coal and munitions is exhausted

The Electrical Contractors' Association (Inc.).—The first annual general meeting was held at Frascati's Restaurant, London, on Tuesday last, October 18th, to consider the report of the Central Board. Mr. W. R. Rawlings welcomed the representatives from Ireland, Scotland and the provinces. After a number of matters of detail had come under discussion and been voted upon, Mr. Hogan referred to the excellent progress of the Association, and spoke very hopefully of its future prospects. In referring to the Press reports of the Manchester church fire, which we mentioned in our last issue, he stated that a large number of fires attributed to fusing did not arise from that cause at all, and it behoved all branches of the Association to investigate all fires attributed to electricity. Strong and immediate action ought to be taken in regard to Press reports of alleged electrical fires, as much harm had already been done to the industry by these false reports. Mr. R. Tweedie Smith addressed the gathering on the subject of municipal trading. Other matters affecting the members of the Association were subsequently arranged, and we may refer to these in the next issue of the Electrical Review.

High-Speed Feed Pumps.—A paper is to hand from Brisbane, by Mr. E. C. Burton, which has for its object the exposure of the inefficiency of feed pumps of the high-speed order. The author asks why the steam end of a feed pump is so much larger than the water end, which is in communication with the same boiler. If the steam end is larger, it should be because the steam is worked expansively, but the author evidently thinks it is larger mainly because there is so very much friction to overcome. American direct-steam pumps had steam ends three and four times as large as the water ends, and none was less than 2¼ times so large, while no British Weir pump had a ratio more than 1·9, the inference being that the better work put into the British pump was responsible for its running with about half the steam of the American proportioned pumps. The rest period of even a duplex pump will usually bring the terminal steam pressure up to boiler pressure. The author finds packings to be the greatest source of inefficiency, and this effect is multiplied in the quick running pumps, and helps towards giving the Weir pump its big lead in economy. Friction is proportional to the surface swept by the piston, whereas the water discharge is proportional to the volume generated.

Then slip is a serious factor in lowering efficiency at low speeds, and the larger pumps have less slip. The water velocity in the suction pipe is a cause of loss, though the author appears to realise that the column of water need not necessarily stand still at any time, for it will continue to move into and through the pump so long as its momentum enables it to flow against the pressure.

Undoubtedly, however, direct-acting pumps do run away from their water. The piston of the pump simply creates a vacuum, and will work in jerks until its steam supply is throttled to stop this action. The author advises an air vessel on the suction side for the purpose of maintaining a steady supply, especially with hot feed. Finally, he apologises for omitting reference to the crankshaft and fly-wheel type of pump, which enables steam to be employed expansively, and, therefore, at better economy.

Nottingham Electrical Engineers.—The ninth annual meeting of the Nottingham Guild of Mechanical and Electrical Engineers was held at the "Rose of England" on 11th inst. The secretary, Mr. F. W. Taylor, read the annual report, showing the guild to be in a prosperous condition, and gave a survey of the outings during the summer vacation.

Faraday Society.—It has been decided to publish the *Transactions* as a quarterly publication, instead of including them in the *Electro-Chemist and Metallurgist*, and the first volume is expected to appear at this end of this year.

Glasgow Technical College Scientific Society.—The opening meeting of the session was held on 15th inst. at 38, Bath Street, when Mr. R. D. Munro delivered his presidential address.

British Steelmakers. — A conference of North of England and West of Scotland steelmakers was held at Newcastle on Tuesday to consider proposals for working arrangements to prevent the present cutting of prices in steel plates and angles. Both sections of manufacturers complain of underselling. It is understood, says the *Times*, that some mutual working arrangement will be agreed upon whereby a ruinous war of rates may be avoided in future.

Victoria Falls (S.A.).—A plot has been discovered at the Victoria Falls to destroy the electric carrier which conveys material for the bridge across the gorge. A Cape boy was bribed to place dynamite in position, but confessed. His confederates—two disaffected foreign employés—will be deported.

The Glasgow International Exhibition.—It is stated that after all claims are met there will be a surplus of £38,000, which is to be devoted to the furtherance of art.

Electrical Mining Machinery.—Messrs. Scott and Mountain, Ltd., of Newcastle-on-Tyne, have just secured a contract from the Alquife Mines and Railway Co., for a complete electrical plant for their mines in the South of Spain, and the installation is of considerable interest, because water power is being used. The Alquife Mining Co. have secured the water rights of the Rio Alcazer, and from this river they are able to get under the worst conditions from 300 to 400 H.P. with a fall of 280 ft. The electrical plant consists of a 300-H.P. double Pelton wheel, with a special form of governor, the turbine being fitted with a heavy fly-wheel and directly coupled to one of Messrs. Scott & Mountain's three-phase alternating-current generators of 250-KW. capacity. This generator delivers three-phase current at a pressure of 500 volts to a transformer where it is transformed to 5,500 volts, and conveyed from the power station to the mine, a distance of nearly 10,000 yards, by bare overhead wires. At the mine, the current is again transformed down to 500 volts by means of step-down transformers for the power motors, and to 250 volts for the lighting of the private houses, workshops, and offices. At the mine, there will be installed two motors of 100 H.P. each for driving the briquetting machinery, and six 15-H.P. motors for driving the elevators, &c., also nine 5-H.P. motors for driving the feeding gear from the kilns, hoists, workshops, &c. About 275 incandescent lamps will also be installed throughout the workshops, offices, &c.

Appointments Vacant.—Lecturer in Electricity and Physics at the Birmingham Municipal Technical School (£140); chief assistant electrical engineer for Farnworth U.D.C. (£120).

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the power station or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*]

Central Station Engineers.—The Perth T.C. has granted Mr. J. LAMBERT an increase of £25, making his salary £280 per annum.

Mr. E. J. JENNINGS, of the St. Pancras B.C. Electricity Department Staff, on leaving to take up a position at Marylebone, has been presented by Mr. S. W. Baynes, on behalf of the staff, with a handsome inlaid music cabinet.

The Poplar B.C. has accepted with regret the resignation of Mr. P. N. HOOPER, electrical engineer and manager, and has acceded to his application for a testimonial under seal. Advertisements are to be issued inviting applications for the vacant position. The commencing salary has been fixed at £400 a year.

On the occasion of his leaving the Burton-on-Trent Corporation Electricity Department to take up another position elsewhere, Mr. G. F. L. ALEXANDER was recently presented by the staff and employés with an oak smoking cabinet of handsome design. Mr. T. Hall, who succeeds him, made the presentation.

Mr. WM. DOBSON, chief assistant engineer at the Amberley Road Works of the Metropolitan Electric Supply Co., Ltd., has resigned in order to take up a position on the staff of the British Westinghouse Company.

Tramway Officials.—A meeting of the Newcastle-on-Tyne Tramways Committee was held on 13th inst., at which a letter was read from Mr. A. E. LE ROSSIGNOL, general manager, resigning his position, the letter being dated September 8th, the day upon which he sent a telegram intimating his intention of doing so. Mr. Le Rossignol, who was present at the Committee meeting, expressed his wish that his duties should cease upon the City Council accepting the resignation. The Committee decided to recommend that Mr. Le Rossignol's salary should be paid to December 8th, the date upon which the notice terminates.

General.—Mr. A. S. E. ACKERMANN, A.C.G.I., A.M.I.C.E., has moved into larger offices at 25, Victoria Street, Westminster.

The King has granted unto Mr. VERNON HARCOURT, Professor of Engineering at University College, London, Royal licence and authority that he may accept and wear the Comthur Cross of the Imperial Order of Franz-Josef, conferred upon him by His Imperial Majesty the Emperor of Austria, King of Hungary, in recognition of valuable services rendered by him to His Imperial Majesty.

Obituary.—It is with feelings of deep regret that we place on record the death of an old friend, in the person of Mr. DESMOND GERALD MANNERS FITZGERALD, which occurred on Sunday, October 9th, at Stanhope, Ashenden, Clare. Mr. Fitzgerald had seen very long service in connection with electrical science, and he was so impressed with the great future that was in store for electricity, that between 40 and 50 years ago he relinquished a position which he had held under the War Office in order to establish an electrical paper. But the time was not then ripe for such a venture, and his *Electrician* only lived for about 2½ years, as it came to an end in 1864. But he deserves full honour for the pioneering part played by him in a matter in which he was in advance of the times. He was a valued contributor to the ELECTRICAL REVIEW until a few years ago, especially on subjects relating to secondary batteries and electro-chemistry. His more important inventions included lithanode, and in his electro-chemical work, he seems to have over and over again been fated to strike upon discoveries which were to bring greater monetary gain to others than he himself would derive therefrom. But this, unfortunately, has been the fate of too many valued workers in the fields of scientific research. Mr. Fitzgerald was 70 years of age at the time of his death, and of late years had not, perhaps, been able to display so prominent an activity in electrical matters as was once the case, but he will be missed by many who knew him and valued his acquaintance as we ourselves did.

NEW COMPANIES REGISTERED.

Muirhead & Co., Ltd. (82,270).—This company was registered on October 12th, with a capital of £50,000 in £10 shares, to acquire the business carried on at Elmers End, Kent, under the style of "Muirhead & Co.," to adopt an agreement with A. Muirhead and F. L. Muirhead, and to carry on the business of electrical, mechanical and telegraphic engineers and contractors, engine builders, boiler makers, electricians, manufacturers of and dealers in dynamos, telegraphic instruments, wires, cables, insulators and any apparatus and things required in connection with the generation, distribution, supply, regulation, accumulation and employment of electricity, heat, steam or other power, iron, brass and metal founders, launch and ship builders, machinists, fitters, millwrights, tube makers, iron and steel converters, smiths, metallurgists, &c. The first subscribers (each with one share) are:—A. Muirhead, D.Sc., F.R.S., The Lodge, Shortlands, Kent; H. J. Muirhead, Fairfield, Hythe, Kent, gentleman; F. L. Muirhead, M.A., LL.B., Downe Lodge, Downe, Kent, barrister; Mrs. M. E. Muirhead, The Lodge, Shortlands, Kent; Mrs. G. J. Muirhead, Fairfield, Hythe, Kent; Mrs. E. E. Muirhead, Downe Lodge, Downe, Kent; and G. J. B. Porter, 2, Wardrobe Place, Doctors' Commons, E.C. No initial public issue. The number of directors is not to be less than three nor more than seven: the first are A. Muirhead, H. J. Muirhead and F. L. Muirhead; qualification, £500; remuneration as fixed by the company.

Weston, Clevedon and Portishead Docks Railway Co., Ltd. (82,275).—This company was registered on October 12th, with a capital of £120,000 in £1 shares, to carry on the business of railway and tramway proprietors, carriers of passengers and goods by land and water, constructors and workers of underground, surface or overhead railways and tramways, whether to be operated by steam, electrical, animal or other power, owners of power stations and other works in connection therewith, suppliers of electricity, contractors for public and private works, including electrical undertakings, financiers, merchants, company promoters, &c. The first subscribers (each

with one share) are:—F. G. Dawson, 123, Cannon Street, E.C., shipping agent; C. F. S. Wright, 7, Kensington Park Road, W., gentleman; J. F. R. Daniel, Fircliff, Portishead, general railway manager; C. G. Penney, 70, Bishopsgate Street, E.C., mineral broker; W. Walker, 17, Fenchurch Street, E.C., accountant; E. A. Gedge, 22, Esmond Gardens, Bedford Park, W., merchant; and F. Cluff, Norton House, High Stone, Leytonstone, N.E., clerk. No initial public issue. The number of directors is not to be less than two nor more than six; the signatories are to appoint the first; qualification, £100; remuneration, £250 per annum for the chairman and £150 each for the others, except managing director.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

General Electric Co., Ltd. (67,307).—This company's annual return was filed on August 24th, when 25,000 preference and 30,180 ordinary shares had been taken up out of a nominal capital of £800,000 in 40,000 preference and 40,000 ordinary shares of £10 each; £10 per share has been called up on 18,000 preference and 5,180 ordinary shares, resulting in the receipt of £231,800; £320,000 is considered as paid on 7,000 preference and 25,000 ordinary. Mortgages and charges: £200,000.

Electrolytic Alkali Co., Ltd. (64,360).—Issue on September 12th of £10,350 debentures, part of series created July 9th, 1904, to secure £50,000, charged on the company's undertaking and property for the time being, including uncalled capital. Trustees: Liverpool Mortgage Insurance Co., Ltd., 6, Castle Street, Liverpool.

Conduit and Insulation Co., Ltd. (50,527).—This company's annual return, made up to September 8th, has been filed. 33,878 shares have been taken up out of a nominal capital of £40,000 in £1 shares. £1 per share has been called up on £15,878, and £15,878 has been received, including £7 paid on 7 forfeited shares. 18,000 shares are considered as fully paid. Mortgages and charges: Nil.

CITY NOTES.

Edison & Swan United Electric Light Co. (Limited and Reduced).

The twenty-first ordinary general meeting of the shareholders of this company was held on Monday at Winchester House, Mr. Henry Wolfenden in the chair.

The Chairman, in proposing the adoption of the report, said that the shareholders would remember that in the concluding part of his speech at the last meeting he remarked that the company was making steady progress. He thought he might fairly claim that the statement he then made had so far been justified. Their sales and earnings this year, when compared with those of the previous year, showed an increase. The quality of their manufactures and the expenses were alike favourable, and their financial position continued to improve. They had still, however, to contend with an opposition, which was very active, but they were quite prepared to meet it; and the confidence of the board in the future of the company's business remained unabated. The balance brought into the account from the profit and loss account was £42,603, which was an increase on the previous year's figures of £11,768, but he trusted that no one would assume that that was the result of higher selling prices. On the contrary, they had to recognise the tendency of the times. The stocks had been priced in their usual conservative manner. After making provision for the debenture interest, amounting to £18,760, they had appropriated £5,000 to depreciation on their freehold and leasehold property. This was much more than they had set aside for a similar purpose in previous years, but the feeling of the directors was that manufacturing premises, *qua* manufacturing premises, necessarily depreciated, and that sufficient attention had not been given to that subject in the past. In what they had done they did not attempt to offer any opinion as to the value of the property, nor must it be assumed that the sum which had been written off for depreciation was intended to be perpetuated each succeeding year. They had also placed £5,000 to depreciation of plant, which was at the rate of about 6½ per cent. upon the sum at which it stood in the company's books at the beginning of the year, and they had also written £1,000 off the tools account. Their stocks had been depreciated by £1,442, which represented more or less the depreciation which was continually going on in such a business as theirs, and in addition they had also put aside the usual £1,000 for future stock depreciation. The reserve created for this purpose had now reached the sum of £3,488, and must be regarded simply in the nature of an insurance fund. They had reserved £1,598 for bad and doubtful debts, which was a sum well in excess of any loss incurred during the year on that account. The net result of the year's trading, after making all the provisions to which he had referred, was a credit balance of £8,891, which would have been available for dividend in the ordinary course of things. Passing to the balance sheet, they would see that the cost of establishing the business, the goodwill, &c., remained at the same figures as before. The debt owing to the company by the Altrincham Co. had been reduced by £1,466; that was to say, that during the year that company had paid them in cash not only the interest on their debenture debt and on the amount they owed to them on open account, but also a further sum of £1,466 in reduction of their indebtedness to the company. Further, he might add that the goods which they supplied to that company were regularly paid for. Doubtless they had noticed the auditors' note with regard to the method of the directors in dealing with the interest accrued during the year on the debt of the Altrincham Co., but he ventured to say that the board were acting in a perfectly correct manner. The directors had no reason to assume that the debt of the Altrincham Co. was not good, but, on the contrary, every indication pointed to its being gradually paid off with interest. They also looked forward to receiving in time a reasonable return on the share capital invested in that company. Their freehold and leasehold property, standing at £82,101, was reduced not only by the writing off of £5,000 for depreciation, but also by a further sum of £2,140, which had been reserved for redemption of leases. Stocks and plant, which amounted together to £234,091, showed a reduction of £11,423, while sundry debtors, £47,003, showed an increase on last year's figures of about £470. This increase was fully accounted for by the fact that the company were doing a larger turnover. Investments at cost and loans on security £26,857, compared with £7,000 last year, and the whole of that amount was easily realisable at short notice. Taking the other side of the balance-sheet, sundry creditors and credit balances which stood at £16,974, showed a reduction of £9,129, as compared with 1903, and a reduction of no less than £29,071 when compared with 1902. The resolution which the shareholders in May last passed, sanctioning the writing down of capital, was confirmed by the Court on July 26th, and its effect was shown in the present balance-sheet, where the "B" share capital appeared as £58,910, instead of £117,820. The amount cancelled, however, did not suffice to extinguish the debit balance brought forward by £3,589, and this amount, therefore, fell to be deducted from the credit balance brought from net revenue account, thus leaving £5,302 to be carried forward to the credit of the current year. As to the future, speaking of the trade of the country generally, the symptoms seemed to point to an improvement rather than to a falling off, and should such an improvement come about, the company would doubtless participate in it. Apart, however, from this general improvement, the directors recognised that what they had to do was to go on steadily perfecting the organisation and resources of the company, to avail themselves of all improvements and discoveries, and produce and sell only the best lamps and the best articles at reasonable prices.

Mr. E. B. Ellice-Clark seconded the motion, and it was carried.

The Underground Electric Railways Co. of London.

The second annual general meeting of the shareholders of this company was held on Tuesday at Hamilton House, Victoria Embankment, Mr. C. T. Yerkes in the chair.

In proposing the adoption of the report, the Chairman said there were a few matters contained therein on which he would like to offer a few remarks. First, as to the power house, which they would see by the report was very nearly finished. The capacity of that power house was more than sufficient to give power to all the company's which were to take power from it. The District Railway, the Great Northern, Piccadilly and Brompton Railway, the Charing Cross, Euston and Hampstead Railway and the Baker Street and Waterloo Railway Co.'s were all compelled, under terms of agreements, to take their power from them. That ensured them selling all the power they made, and at the same time it gave those companies their power at a very much lower cost than would be the case if they had their own power houses, as, by concentration, they were able to manufacture power much cheaper. The electrification of the District Railway was getting on very nicely. They had been kept back somewhat by the manufacturers of material, and they would be delayed a little by their car-builders, and while they expected to get trains on the road at the commencement of the year, all the road would not be running at that time. It must be understood that it was impossible to take steam trains off one night and commence with electric trains the next morning. It must be done gradually for several reasons, the chief being that the men were not educated, and that the signals could not be worked properly, and therefore it would not be safe to do it suddenly. The Baker Street and Waterloo Railway was progressing rapidly, although they would be a little late on account of the laying of the permanent way, and also through the building of the street stations, but they hoped the delay would not be much. The Great Northern, Piccadilly and Brompton, and the Charing Cross, Euston and Hampstead were going on very well, and as fast as they could expect. The London United trams, in which the company had a controlling interest, were doing a very good business indeed. They were doing a constantly improving business, and while they thought proper to reduce the dividend at the last meeting, yet they were in hopes that the receipts of the company, and also the decrease in the expenses, would be such that they would be able before long to return to the 8 per cent. dividend on the ordinary shares.

Lord Farrer seconded the motion.

Mr. Walford asked which part of the District Railway it was proposed to have electric trains on first—the inner circle, or some of the outlying lines?

The Chairman replied that in all probability the first electric trains would be run between Ealing and the Mansion House. On the general question as to whether electrical working was going to be very much more economical than working by steam, he had not the slightest doubt. If precedents were anything to guide them, they were going to be run very much cheaper. He understood that in the *Times* of that day there was an article dealing with a railway in New York, and pointing out the difference in cost between when it was worked by steam, and when it was worked by electricity, and it showed that the latter was much cheaper. In the first place, they were enabled to operate more cheaply; in the second place, they operated a great many more trains, and in the third place, it was much more comfortable. He could not conceive anything more uncomfortable than the present District Railway, and he hoped that when it was electrified it would

be a pleasure for the public to travel by it, instead of a pain, as at present.

The report was adopted.

The Chairman, in proposing a resolution giving the directors power to raise £850,000 on the security of the power house, said that the amount already authorised was eight millions. They found that that would leave them a little short, and, therefore, they proposed that they should have power to borrow an additional £850,000.

Lord Farrer seconded the motion, and it was carried.

The Monte Video Telephone Co.

The directors' report, to be presented at the meeting to be held at Winchester House on Wednesday, October 26th, reads:—

The directors herewith present the audited statement of accounts for the year ending July 31st last, showing a net profit for that period of £18,527 after providing for all working expenses in Monte Video and London. To this amount should be added the sum of £1,784 brought forward from last year, leaving an available balance of £15,311. After putting aside £2,000 to a reserve for renewal of plant, and transferring the sum of £5,000 to reserve fund, the directors recommend payment of the full dividend at the rate of 5 per cent. per annum upon the preference share capital, and of a dividend at the rate of 3 per cent. per annum upon the ordinary share capital, leaving a balance of £1,806 to be carried forward. During the recent civil war, telephonic communication in the provincial districts of Uruguay was much interrupted. The number of subscribers and the revenue therefrom in Monte Video continued to improve.

Richardsons, Westgarth & Co.—The report for the year ended August 25th last, to be submitted at the meeting at Hartlepool on the 31st inst., shows profits (after maintaining buildings and machinery at a cost of £18,221), amounting to £74,503. To this has to be added the balance brought forward from the year to August 25th, 1903, £17,382, together £91,885. The directors recommend a dividend on the ordinary shares for the half-year ended August 25th, 1904, at the rate of 6 per cent. per annum, making 6 per cent. for the year. There has been set aside for depreciation £15,000, and carried forward £16,635. The directors are of opinion that, considering the continued depression in all trades connected with engineering, the results are satisfactory.

Electrolytic Alkali Co.—The report for the past year states that, after allowing for expenditure on maintenance of buildings, plant and machinery, and for depreciation, the net profit amounts to £521; this, with £852 from previous year, is carried forward. The process is working well, but great depression exists in the market for bleaching powder.

The Siam Electricity Co.—At the eleventh ordinary meeting held a few weeks ago at Bangkok, the report and accounts for the half-year ended June last were submitted. The gross profits for the year were 364,510.21 ticals; amount set aside for depreciation, 96,302 86; interest, 26,825.55; bad debts written off, 1,875.47; leaving a profit of 239,506 33 ticals, which, together with balance for last half year of 129,717.53, make a total at the disposition of the company of 569,223.86 ticals. The sum set aside to redemption was 6,000.00, and a dividend for the half year of 6 per cent. (10 82 ticals per share) was declared, the balance 200,923.86 ticals being carried forward. The chairman, Mr. A. Westenholz, stated that during the half-year in question, a half million car-miles had been run through the crowded streets without a single accident. An increase in rolling stock is anticipated.

Globe Telegraph and Trust Co.—The directors have declared a dividend of 2s. each on the ordinary shares.

Stock Exchange Notices.—The Committee has ordered the undermentioned to be officially quoted:—

Metropolitan Railway.—£3,611,558 3½ per cent. preference stock; £1,110,715 3½ per cent. "A" preference stock; £3,601,278 3½ per cent. debenture stock; and £335,214 3½ per cent. "A" debenture stock, in lieu of the preference and debenture stocks now quoted.

Callender's Cable and Construction Co.—The directors have decided to pay an interim dividend of 5s. per share, being at the rate of 10 per cent. per annum, on the ordinary shares of the company. The ordinary share register will be closed from the 20th to 31st inst., both days inclusive. Sir J. Fortescue Flannery, M.P., has been elected a director of this company in place of Lieut.-Col. G. A. Elliot (deceased).

Oriental Telephone and Electric Co.—The directors have declared an interim dividend of 3 per cent. on the 6 per cent. cum. pref. shares for the current year, also an interim dividend of 3 per cent. on the ordinary shares for the year.

Western Telegraph Co.—After placing £22,000 to general reserve, and £18,000 to maintenance ships' reserve fund, the directors recommend a final dividend of 3s. per share, making a total dividend of 6 per cent. for the year ended June 30th, 1904, and a bonus of 2s. per share.

The South London Electric Supply Corporation.—The company reports having sold during the first nine months of the current year 6,590,572 units, as against 2,788,400 units for the corresponding period of last year, showing a gross revenue of £51,909, as against £27,065.

STOCKS AND SHARES.

Wednesday Evening.

Whereas the markets of the Stock Exchange have, as a whole, undergone a certain reaction after their substantial rise, the electrical departments continue to maintain their vigour, and there is little set-back in any of the sections that come under our notice here. Investors as well as speculators have been taking profits, and although business remains fairly satisfactory, it is not of the kind—for the moment—that encourages higher levels. Money is still plentiful enough, and no doubt we shall soon be hearing that it is a "drug in the market." The several new loans of gilt-edged character which are said to be on the point of appearance will find a ready-made demand for stock offered upon reasonable terms.

The County of London Electric Lighting Co. is offering its proprietors the £150,000 Second Debenture stock that constitutes the balance of the stock which was authorised but not issued. Par is the price asked, and since the stock is underwritten, its acceptance by the shareholders does not make any great difference to the company. The underwriters receive a commission which, if not excessive, forms a fairly substantial reward for the part they play. County First Debenture has been raised a point to 107½, while the Second Debenture—with which the new issue will rank in due course—stands at about 103. There is small risk in taking the stock, the security being good. At 12 the company's Preference shares show a ¼ improvement. City Lights improved to 10⅜, and the company's First Debenture shows a rise of 2 at 124 middle.

Edmundson's Preference at 6¼ have risen ⅛, and are now in line with the Ordinary shares as regards price. London Electric Preference hardened ⅛ to 5⅜, and Metropolitan Preference are ⅛ better at 5⅜; but St. James's lost 10s., and are back to 14½. Curiously, the Debenture stock is 1 down at 97½, and so is Central Electric 4 per cent. Debenture at 107½. South Metropolitan 4½ per cent. Debenture advanced a point. An evening paper justly draws attention to the good yields offered by the best-class Electric Lighting Shares, and quotes the coming of winter as a possible reason for further attention being paid to this market by the investor.

Electric Railway stocks are decidedly good. Central London Ordinary rose 2, and is now 90½, the other issues remaining unchanged. The Ordinary and Deferred offer the best scope for improvement. Metropolitan Consolidated has at length reached the round century, although the Surplus Lands stock keeps at 76. Districts are better at 43, and there has been further inquiry for Great Northern and City Preferred shares at 5½. City and South London is still about 48, and Waterloo and City at 87½ continues neglected.

Of the traction securities, a feature is the strength of Metropolitan Electric 4½ per cent. Debenture stock, now up to 102. Expert authority assures us that the line is doing much better than its most sanguine supporters expected at the start. The Preferred shares at 1⅝, and the Deferred at 5s. have not begun to move yet. Anglo-Argentine Ordinary are only ¼ under 7, and Auckland Debenture has firmed up to 104½. A halt in Buenos Ayres and Belgrano shares leaves the Ordinary at 3 1/16, while City of Buenos Ayres shares are 10½. This company's 6 per cent. Debenture stock is quoted at 142½, and we understand that it will be exchanged for the new 4 per cent. Debenture stock in the Anglo-Argentine Co. as early as possible in the new year. For £100 6 per cent. Debenture, holders will, of course, receive £150 of the new Fours, giving the same return on the nominal value. British Electric Tractions are quiet at 70. Perhaps the attention now being paid to economy in the company's working may account for some of the recent buying in the hope that the saving may influence the dividends.

Mention having been made on two recent occasions in these columns of the South Wales Electrical Power Distribution Co., it may be added that the 5 per cent. Debenture stock has jumped 4 points to 104, with none offering either in the London or the West of England Stock Exchanges. The shares are 8 5/16 bid, and were done at 8⅜ the other day. The next move in this direction will, perhaps, take the shape of an important new company of similar type for operating in one of the most extensive coalfields in the North of England.

Several of the well-known Telegraph stocks and shares that were *ex* dividend last account day, have recovered all, or most, of the deductions. The Eastern group is firm, in contrast to the dulness of Anglo-American Telegraph stocks, where the dividend declaration still exercises a depressing effect. Submarines are a good market, along with American Railroad shares, and Direct United States shares are the dividend of 3s. better. Globe Telegraph and Trust were unaltered upon the declaration of 3s. and 2s. dividends upon the Preference and Ordinary shares repectively.

Amongst Telephone issues, National Preferred added 2 to 107, upon support from the provinces. It is suggested that the next dividend will be raised, and the negotiations with the Government are said to be steadily progressing. United River Plate Telephone at 6½ are sharing in the pronounced strength of all shares connected with the Argentine. Monte Video at 10s. are not unaffected by the appearance of a fairly encouraging report. Now that the revolution is over, things Uruguayan should settle down for a month or two, until the next rebellion comes along.

Miscellaneous descriptions have rises to display in both the Edison and Swan Debenture stocks. The 4 per cent. is up 1 at 80½, and the Second advanced 2 to 81½. Henley's at 11 carry the interim dividend of 5s. per share just announced.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. ‡	Dividends for the last three years. 1901.	1902.	1903.	Closing Quotations Oct. 12th.	Closing Quotations Oct. 19th.	Business done week ended Oct. 19th, 1904. Highest	Lowest
67,100	African Direct Telegraph, 4 % Debs.	100	..	..	..	98 —102	98 —102	..	..
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	..	..	..	2¼— 2½	2¼— 2½	..	..
119,700‡	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	..	..	..	.. — ..	.. — ..	..	..
788,840	Anglo-American Telegraph	Stock	6½.	6d/6	6½.	50 — 53	49 — 52 xd	50½	..
3,105,580	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	96 — 98	96 — 98 xd	97	96½
3,105,580	Do. do. do. Deferred	Stock	2s.	1/-	2s.	8 — 8½	7⅞— 8⅛	8⅛	7⅞
44,000	Chili Telephone, Nos. 1 to 44,000	5	5 %	6 %	7 %	5 — 5½	5 — 5½	5 1/16	5⅛
18,883,300§	Commercial Cable	$100	8 %	8 %	..	170 —190	170 —190	..	..
1,841,209	Do. do. Sterling 500 year 4 % Deb. Stock Red.	Stock	..	..	..	93 — 96	93 — 96	94⅜	94½
16,000	Cuba Telegraph	10	4 %	6¾%	5 %	7 — 8	7 — 8	..	..
6,000	Do. 10 % Pref.	10	..	..	..	15 — 16	15 — 16	..	..
6,000	Direct Spanish Telegraph 10 % Cum. Pref.	5	..	..	..	7 — 8	7 — 8	..	..
80,000	Do. do. 4½ % Debs.	50	..	..	..	98 —101⅝	98 —101 %	..	..
60,710‡	Direct United States Cable	20	3½%	3½%	3 %	10½ — 10⅝	10½ — 10⅝	10 1/16	10½
81,800	Direct West India Cable, 4½% Reg. Deb., within Nos. 1 to 1,200, Red.	100	..	..	..	100 —102	100 —102	..	..
4,000,000	Eastern Telegraph, Ord. Stock	Stock	7 %	7 %	7 %	132 —137	131 —136	135	133½
1,955,555	Do. 8½ % Pref. Stock	100	..	..	..	87 — 90	86 — 89 xd	88½	87½
1,534,545	Do. 4 % Mort. Deb. Stock Red.	Stock	..	..	..	106 —109	106 —109	107⅜	..
800,000	Eastern Extension, Australasia, and China Telegraph	10	7 %	7 %	7 %	12¼— 13	12½— 13 xd	12 15/16	12½
320,000‡	Do. 4 % Deb. Stock	Stock	..	..	..	105 —108	105 —108	107⅜	..
800,000	Eastern & South African Tele., 4% Mt. Db., Nos. 1 to 3,000, red. 1909	100	..	..	..	100 —103	100 —103	..	..
200,000‡	Do. do. 4 % Reg. Mort. Debs. (Mauritius Sub.) 1 to 3,000	25	..	..	..	101 —104	101 —104	..	..
180,227	Globe Telegraph and Trust	10	5½%	£3 16 7*	5½%	9½— 9¾	9½— 9¾	9 15/16	9¾
180,042	Do. do. 6 % Pref.	10	..	..	..	13½— 14½	13½— 14½	14	13 13/16
150,000	Great Northern Telegraph, of Copenhagen	10	15 %	12½%	15 %	28½— 29½	28½— 29½	..	..
54,700	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	..	..	..	100 —102	100 —102	..	..
17,000	Indo-European Telegraph	25	10 %	10%	10 %	44 — 47	44 — 47	..	..
72,680	Monte Video Telephone Co., Ltd., Ord.	1	..	..	..	7/16— 9/16	7/16— 9/16	..	..
1,983,333	National Telephone, Pref. Stock	100	5 %	6 %	6 %	104 —106	106 —108	107½	105½
1,966,667	Do. do. Def. Stock	100	..	4½%	5 %	92 — 94	96 — 98	97	93½
15,000	Do. do. 6 % Cum. 1st Pref.	10	6 %	6 %	6 %	12 — 14	12 — 14	13½	12½
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	11 — 13	11 — 13	..	..
2,250,000	Do. do. 5 % Non-cum. 3rd. Pref., 1 to 250,000	5	5 %	5 %	5 %	5⅛— 5⅜	5⅛— 5⅜	5 3/16	..
000,000‡	Do. do. 3½ % Deb. Stock Red.	Stock	3½%	3½%	3½%	97 — 99	97 — 99	97½	96½
689,593	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	104 —106	104 —106	105⅜	104½
1,000,000	Do. do. Prov. Certs., 35 % to be paid	..	..	..	..	67 — 69	67 — 69	..	..
179,318	Oriental Telephone and Elec. Nos. 1 to 171,504, fully paid	1	6 %	6 %	6¾%	1⅛— 1 3/16	1⅛— 1 3/16	..	..
50,000	Do. do. do. 6 % Cum. Pref.	1	..	..	..	1⅛— 1⅛	1⅛— 1⅛	..	..
100,000‡	Pacific and European Tel., 4 % Guar. Debs., 1 to 1,000	100	..	..	..	97 —100	97 —100	..	..
11,889	Reuter's	8	5 %	5 %	..	6¾— 7⅛	6¾— 7⅛xd	..	..
8,808	Submarine Cables Trust	Cert.	..	..	..	118 —123	117 —122 xd	119½	..
58,000	United River Plate Telephone	5	7 %	7 %	..	6 — 6½	6⅛— 6⅜	..	..
40,000	Do. do. 5 % Cum. Pref., Nos. 1 to 40,000	5	..	..	..	4½— 5½	4½— 5½	5 1/16	..
179,947‡	Do. do. 5 % Debs.	Stock	..	..	..	103 —106	103 —106	..	..
15,600	West African Telegraph, Shares	10	..	2 %	4 %	6 — 7	6 — 7	6⅛	..
30,008	West Coast of America, 1 to 30,000 and 53,001 to 53,008	2½	..	..	..	1/16— 3/16	1/16— 3/16	..	..
150,000‡	West Coast of America, 4% Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	..	..	..	97 —100	97 —100	..	..
267,980	Western Telegraph, Ltd., Nos. 1 to 207,980	10	7 %	7 %	7 %	12½— 13	12½— 13	13	12⅝
75,000‡	Do. do. 5 % Debs. 2nd series, 1906	100	..	..	..	101 —104	101 —104	..	..
400,000	Do. do. 4 % Deb. Stock Red.	100	..	..	..	101 —104	101 —104	..	..
88,321	West India and Panama Telegraph	10	..	..	..	⅜— ½	⅜— ½	..	..
84,563	Do. do. do. 6 % Cum. 1st Pref.	10	..	..	..	6½— 7	6½— 7	6⅝	..
4,669	Do. do. do. 6 % Cum. 2nd Pref.	10	..	..	..	5 — 6	5 — 6	..	..
80,000‡	Do. do. do. 5 % Debs., Nos. 1 to 1,600	100	..	..	..	100 —103	100 —103	..	..

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

20,000	British Aluminium 7 % Cum. Pref.	10	..	..	..	5 — 6	5 — 6	5½	..
10,000	Do. do. "A" 6 % Cum. Pref.	10	..	..	..	8½— 9½	8½— 9½	8⅝	..
800,000‡	Do. do. 5% 1st Mort. Deb. Stock Red.	Stock	..	..	..	94 — 98	94 — 98	..	..
100,000	British Electric Traction	10	9 %	8 %	..	9½— 10	9⅞— 10⅛	10 1/16	9⅞
100,000	Do. do 6 % Cum. Pref.	10	..	..	..	10⅞— 11⅛	10⅞— 11⅛	..	..
600,000	Do. do. 5 % Perpetual Debenture Stock	Stock	..	..	..	115 —118 xd	115 —118	117⅛	..
	Do. do. 4½% 2nd Deb. Stock Red.	100	..	..	..	96 — 97	94 — 97	97	96½
100,000	British Insulated and Helsby Cables	5	10 %	10 %	8 %	5¾— 6	5¾— 6	..	..
100,000	Do. do. 6 % Cum. Pref.	5	..	..	..	5⅞— 6	5⅞— 6	..	..
50,000	Do. do. 4½ % 1st Mort. Deb. Red.	100	..	..	..	101 —104	101 —104	..	..
50,000	¶Brown, Lindley & Co., Ord.	£1	Nil	..	..	1/16— 1/8	1/16— 1/8	..	..
50,000	¶ Do. do. 6 % Cum. Pref.	£1	6 %	..	..	14/6 to 15/6	14/6 to 15/6	..	..
105,781	Brush Electrical Engineering, Ord., 1 to 105,781	2	Nil	Nil	Nil	½— ¾	½— ¾	..	..
150,000	Do. do. Non-cum. 6 % Pref.	2	3 %	6 %	6 %	1 — 1½	1 — 1½	..	..
125,000‡	Do. do. 4½ % Perp. Deb. Stock	Stock	..	..	..	94 — 97	93 — 96	..	..
*25,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock	Stock	..	..	..	70 — 75	70 — 75	..	..
35,000	Callender's Cable Construction shares	5	20 %	15 %	12½%	9½— 10½	9½— 10½	9⅞	9½
40,000	Do. do. do. 5 % Cum. Pref.	5	..	..	..	5 — 5½	5 — 5½	..	..
90,000‡	Do. do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	..	..	..	101 —105	102 —105	104½	103½
1,860,014	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	87 — 90	89 — 92	91⅝	89½
494,093	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	100 —102	100 —102	100½	..
494,993	Do. do. Def. do.	Stock	4 %	4 %	4 %	79 — 81	79 — 81	80⅜	80½
1,330,000	City and South London Railway	Stock	2 %	3½%	2¾%	47 — 49	47 — 49	48	47
85,000	Crompton & Co., Nos. 1 to 85,000	5	7½%	5 %	..	1½— 2	1½— 2	1 15/16	..
100,000‡	Do. 5 % 1st Mort. Reg. Debs., to 900 of £100, and 901 to 11,000 of £50 red.	..	..	..	..	90 — 95	90 — 95	..	..
99,261	Edison & Swan United Elec. Light, "A" shares, £3 paid, 1 to 99,261	5	Nil	Nil	..	⅜— ¾	⅜— ¾	..	..
17,189	Do. do. "A" shares, 01—017,189	5	Nil	Nil	..	1 — 2	1 — 2	..	..
44,023‡	Do. do. 4 % Deb. Stock Red.	100	..	..	..	77 — 82	78 — 83	..	..
100,000‡	Do. do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	..	..	..	78 — 82 xd	79 — 84	..	..
112,100	Electric Construction 1 to 112,100	2	6 %	6 %	4 %	1 — 1⅛	1⅛— 1⅛	1 1/16	..
81,890	Do. do. 7 % Cum. Pref., 1 to 81,890	2	..	..	..	2 — 2⅛	2 — 2⅛	..	..
82,500‡	Do. do. 4 % Perp. 1st Mort. Deb. Stock	Stock	..	..	..	96 — 99	97 —100	..	..
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	..	9 — 9½	9 — 9½	..	..
200,000	Do. do. 4 % Mort. Deb.	Stock	..	..	..	91 — 96 xd	91 — 96	..	..
200,000	Henley's (W. T.) Telegraph Works, Ord.	5	20 %	20 %	15 %	10½ — 11½	10½ — 11½	10⅝	..
200,000	Do. do. 4½ % Pref.	5	..	..	..	5 — 5½	5 — 5½	5 1/16	..
45,900	Do. do. 4½ Mort. Deb. Stock	Stock	..	..	..	107 —111	108 —111	..	..
50,000	India-Rubber, Gutta-Percha & Telegraph Works	10	10 %	10 %	..	19 — 20	19 — 20	19 1/16	19½
300,000‡	Do. do. 4 % 1st Mort. Deb.	100	..	..	..	99 —102 xd	99 —102	..	..
37,500	†Liverpool Overhead Railway, Ord.	10	1½%	1½%	..	3⅜— 3⅝	3⅜— 3⅝	..	..
10,000	† Do. do. Pref. £10 paid	10	..	..	..	10 — 10½	10 — 10½	..	..
87,850	Telegraph Construction and Maintenance.	12	20 %	20 %	20 %	85 — 88	86 — 89	88	87
150,000‡	Do. do. 4 % Deb. Bds., Nos. 1 to 1,500 Red. 1909	100	..	..	..	101 —104	101 —104	..	..
540,000‡	Waterloo & City Railway, Ord. Stock	100	3 %	3½%	3½%	86 — 89	86 — 89	..	..

* A period of nine months. † Quotations on Liverpool Stock Exchange. ‡ Unless otherwise stated all shares are fully paid. ¶ From Manchester Share List.

Bank rate of discount 3 per cent. (April 21st 1904).

SHARE LIST OF ELECTRICAL COMPANIES (continued).—ELECTRICITY SUPPLY COMPANIES.

Present Issue.	NAME.	Stock or Share.	Dividends for the last three years 1901.	1902.	1903.	Closing Quotations Oct. 12th.	Closing Quotations Oct. 19th.	Business done week ended Oct. 19th, 1904. Highest.	Lowest
20,000	Brompton & Kensington Electric Light Sup., Ord., 1 to 20,000 ..	‡ £	8%	8 %	10 %	10½ — 11	10½ — 11	..	..
20,000	Do. do. 7 % Cum. Pref. ..	£	..	..	..	10½ — 10⅝	10½ — 10⅝	..	..
250,000	Central Electric Supply 4 % Guar. Deb. Stock	100	..	..	..	107 —110	106 —109	107	..
50,000	Charing Cross and Strand Electricity Supply	£	10 %	10 %	8 %	8¼ — 9	8¼ — 9	9	8½
70,000	Do. do. 4½% Cum. Pref. ..	£	..	..	..	5⅛ — 5½	5⅛ — 5½	5⅝	5½
40,000	Do. do. "City Undertaking" 4½% Cum. Pref. ..	£	..	..	..	4⅜ — 5	4⅜ — 5	..	..
40,000	Do. do. 1903	£	..	..	..	4⅜ — 5	4⅜ — 5	4 15/16	4 13/16
250,000	Do. do. 4 % Deb. Stock Red.	100	..	..	..	103 —105	103 —105	..	..
44,486	*Chelsea Electricity Supply, Ord.	£	4 %	4½%	5¼%	6½ — 7	6½ — 7	6¾	..
150,000‡	Do. do. % Deb. Stock Red.	Stock	..	..	..	108 —111	108 —111	..	..
70,595	City of London Electric Lighting, Ord. 40,001—110,595 ..	£	5 %	5 %	5 %	10½ — 10¾	10½ — 11	10 11/16	10⅝
40,000	Do. 6 % Cum. Pref., 1 to 40,000	£	10	..	..	13 — 14	13 — 14	13 13/16	..
400,000‡	Do. 5 % Deb. Stock, Scrip. (iss. at 115) all paid ..	£	..	..	..	120 —125	122 —126	..	..
300,000	Do. 4½% 2nd Deb. Stock, Prov. Certs., all paid ..	100	..	..	..	103 —106	103 —106	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	£	4 %	4 %	4 %	8½ — 9½	8½ — 9½	8¾	..
20,000	Do. do. do. 6 % Pref., 40,001—60,000.	£	10	..	..	11½ — 12	11½ — 12¼	12⅛	11 7/16
400,000‡	Do. do. 4½% Deb. Stock	£	..	..	..	105 —108	106 —109	107½	107
250,000	Do. do. 4½% 2nd Deb. Stock	Stock	..	..	..	102 —105	102 —105	104½	..
70,000	Edmundson's Electric Corporation, Ord. Shares	£	7 %	7 %	7 %	6⅝ — 6¾	6½ — 6¾	6¾	6½
70,000	Do. do. 6 % Cum. Pref.	£	..	..	..	6 — 6¼	6⅜ — 6⅝	6½	6 3/16
300,000‡	Do. do. 4½% 1st Mort. Deb. Stock ..	£	..	..	..	105 —108	105 —108	107	106½
21,000	Kensington and Knightsbridge Electric Ord.	100	10 %	10 %	12½	12 — 13	12 — 13	..	..
90,000	Do. do. do. 4 % Debenture Stock ..	Stock	..	..	..	101 —104	101 —104	..	..
110,000	London Electric Supply Corporation, Limited, Ord.	£	..	..	..	1½ — 2½	1½ — 2½	..	..
49,840	Do. do. do. 6 % Pref.	£	..	..	..	5 — 5¼	5¼ — 6	5 15/16	5 11/16
250,000‡	Do. do. do. 4 % 1st Mort. Deb. Stock Red	Stock	..	..	..	97 —100	96 — 99	96	..
100,000	Metropolitan Electric Supply, 1 to 100,000	£	6½%	7½%	8½%	15⅜ — 16½	15⅜ — 16½	16¼	15¾
71,106	Do. do. 4½% Cum. Pref. 1—71,106, £3 paid ..	£	5	..	..	6⅝ — 6⅞	6½ — 6¾	6⅝	6 11/16
220,000‡	Do. do. 4½% 1st Mort. Deb. Stock	£	..	..	..	112 —117	112 —117	..	..
250,000‡	Do. do. 3½% Mort. Deb. Stock Red	Stock	..	..	..	96 — 99	96 — 99	..	..
10,552	Notting Hill Electric Lighting	£	10 %	6 %	6 %	14½ — 15½	14½ — 15½	..	..
59,000	Do. do. 4% 1st Mort. Deb.	100	..	..	..	99 —102	99 —102	..	..
40,000	St. James' and Pall Mall Electric Light, Ord.	£	14½%	14½%	14½%	13½ — 15½	14 — 15	14 1/16	14 1/16
20,000	Do. do. do. 7 % Pref. 20,001 to 40,000	£	..	..	..	8 — 9	8 — 9	..	..
150,000‡	Do. do. do. 3½% Deb. Stock Red ..	100	..	..	..	98 —101	98 —101	..	..
12,000	Smithfield Markets Electric Supply, Ord.	£	..	2½%	4 %	2½ — 3½	2⅜ — 3½	..	..
50,000	Do. do. do. 4 % Deb. Stock	Stock	..	..	..	83 — 87	83 — 87	..	..
65,000	South London Electricity Supply, Ord.	£	..	12½%	8 %	4½ — 4¾	4½ — 4¾	4 7/16	..
100,000	South Metropolitan Electric Light and Power Ord. ..	£	..	..	..	¾ — 1	¾ — 1	..	..
50,000	(Late Blackheath and Greenwich 7 % Pref. ..	£	..	..	..	1½ — 1¾	1½ — 1¾	1 13/16	..
100,000	Dist. E.L.Co.) 4½% 1st Deb. Stock	100	..	..	..	104 —108	105 —109	107½	106½
80,000	Urban Electric Supply, Ord.	£	..	..	..	4½ — 5	4½ — 5	4 15/32	..
80,000	Do. do. 5 % Cum. Pref.	£	..	..	..	4½ — 5	4½ — 5	..	..
200,000	Do. do. 4½% 1st Mort. Deb. Stock Red	100	..	..	..	100 —102	100 —102	101½	..
110,000	Westminster Electric Supply, Ord.	£	10½%	12 %	13½%	12⅜ — 13⅝	12⅜ — 13⅝	13 5/16	12 13/16
28,141	Do. do. 5 % Cum. Pref.	£	..	..	..	6¼ — 6⅝	6¼ — 6⅝	6 11/16	..

*Subject to Founders Shares. ‡ Unless otherwise stated all shares are fully paid.

MARKET QUOTATIONS, Wednesday, October 19th.

CHEMICALS, &c.

		Latest Price.	Week's Inc. or Dec.
a Acid, Hydrochloric .. .. .. per cwt.		5/-	..
a ,, Nitric .. .. per cwt.		22/-	..
a ,, Oxalic .. .. per cwt.		33/-	..
a ,, Sulphuric .. .. per cwt.		5/6	..
a Ammoniac, Sal .. .. .. per cwt.		42/-	..
a Ammonia, Muriate (crystal) .. per ton		£33 10	..
a ,, ,, ... per ton		£30	..
a Bleaching powder .. .. .. per ton		£4 10	..
a Bisulphide of Carbon .. .. .. per ton		£15	..
a Borax .. .. per ton		£13	..
a Benzole (90 %) .. .. .. per gal.		7/-	..
a ,, (50/90 %) .. .. .. per gal.		5/6	..
a Copper Sulphate .. .. .. per ton		£19	..
a Lead, Nitrate .. .. .. per ton		£25	..
a ,, White Sugar .. .. .. per ton		£31	..
a ,, Peroxide .. .. .. per ton		£27 10	..
a Methylated Spirit .. .. .. per gal.		2/6	..
a Naphtha, Solvent (90% a 160° C). per gal.		5/6	..
a Potash, Bichromate, in casks .. per lb.		8d.	..
a ,, Caustic (75/80%) .. .. per ton		£24	..
a Shellac .. .. per cwt.		210/-	..
a Sulphate of Magnesia .. .. per ton		£4 10	..
a Sulphur, Sublimed Flowers .. per ton		£6 10	..
a ,, Recovered .. .. per ton		£5 10	..
a ,, Lump .. .. .. per ton		£5	..
a Soda, Caustic (white 70 %) .. per ton		£10 15	..
a ,, Crystals .. .. .. per ton		£8	..
a ,, Bichromate, casks .. .. per lb.		2½d.	..

METALS, &c.

b Aluminium Ingots, in ton lots .. per ton		£180	..
b ,, Wire, in ton lots .. per ton		£168	..
b ,, Sheet, in ton lots .. per ton		£166	..
b Babbitt's metal ingots .. .. per ton		£43 to £140	inc.
c Brass (rolled metal 2" to 12") basis per lb.		6¾d.	..
c ,, Tube (brazed) .. .. per lb.		8¾d.	..
c ,, ,, (solid drawn) .. .. per lb.		7¾d.	..
c ,, Wire, basis .. .. .. per lb.		7d.	..
c Copper Tubes (brazed) .. .. per lb.		9½d.	..
c ,, ,, (solid drawn) .. per lb.		9½d.	..
c Copper Bars (best selected .. per ton		£74	..

METALS, &c. (continued).

		Latest Price.	Week's Dec. or Inc.
g Copper Sheet .. .. .. per ton		£74	..
g ,, Rod .. .. per ton		£74	..
e ,, (Electrolytic) Bars .. per ton		£64	..
e ,, Sheets .. per ton		£80	..
e ,, Rod .. per ton		£74	..
e ,, ,, H.C. Wire .. per lb.		9¼d.	..
f Ebonite Rod .. .. .. per lb.		8/8	..
f ,, Sheet .. .. .. per lb.		8/-	..
n German Silver Wire .. .. per lb.		1/6	..
h Gutta-percha fine .. .. per lb.		8/-	..
h India-rubber, Para fine .. .. per lb.		4/9 to 4/10	..
i Iron, Charcoal Sheets .. .. per ton		£18	..
i ,, Pig (Cleveland warrants) per ton		44/1	5½d. inc.
i ,, Forgings, according to size per ton		From £11	..
i ,, Scrap, heavy .. .. per ton		47/6 to 50/-	..
i ,, Wire, galvanised No. 8 .. per ton		£9 15	..
g Lead, English Ingot .. .. per ton		£12 10	6/3 to 7/6 inc.
g ,, ,, Sheet .. .. per ton		£11 17s. 6d.	..
m Manganin Wire No. 28 .. .. per lb.		8/-	..
g Mercury .. .. .. per bot.		£7 15	..
d Mica (in original cases) small .. per lb.		6d. to 1/	..
d ,, ,, ,, medium per lb.		2/6 to 4/-	..
d ,, ,, ,, large .. per lb.		4/6 to 8/6	..
p Phosphor Bronze, plain castings per lb.		1/- to 1/2½	..
p ,, rolled bars & rods per lb.		1/- to 1/3	..
p ,, ,, strip & sheet per lb.		From 1/1	..
o Platinum .. .. per oz.		£4	..
e Silicium Bronze Wire .. .. per lb.		9d. to 11d.	..
i Steel, Magnet, acc'd'g to desc'p'n per ton		£58	..
i ,, ,, in bars		£15 to £40	..
g Tin, Block .. .. per ton		£133 to £134	£2 inc.
g ,, Foil .. .. per lb.		1/6	..
n ,, Wire, Nos. 1 to 16 .. .. per lb.		1/8	..
p White Anti-friction Metals— "White Ant" brand .. per ton		£42 to £62	..
j Yarns, 2/10s Grey Cotton, on sp'l's per lb.		8d.	..
j ,, 6 lea. Flax .. .. .. per lb.		5½d.	..
j ,, 3 ply 10 lbs. Russian .. per lb.		4½d.	..
j ,, 10 lbs. Russian, single .. per lb.		4½d.	..
j ,, 180 lbs. Jute rove .. per ton		£11	..
k Zinc, Sh'ts (Vieille Montagne brd.) per ton		£25 15	..

Quotations supplied by Messrs.:—a G. Boor & Co.; b The British Aluminium Co., Ltd.; c Thos. Bolton & Sons., Ltd.; d F. Wiggins & Sons.; e Frederick Smith & Co., f India-Rubber, G.P. and Teleg. Works Co., Ltd.; g James & Shakspeare; h Edward Till & Co.; i Bolling & Lowe; j Walter H. Hindley and Co., Ltd.; k Morris Ashby, Ltd.; m W. T. Glover & Co., Ltd.; n P. Ormiston & Sons; o Johnson, Matthey & Co., Ltd.; p The Phosphor Bronze Co., Ltd.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Week ending	Receipts for the week. £	£*	No. wks.	Total to date. £	£*	Miles open.	*
Aberdeen	Oct. 15	1,254	+ 43	20	31,708	+ 5,626	10	—
Bath	,, 12	641	—	42	26,682	—	12½	—
Birmingham ..	,, 15	5,456	+825	42	225,958	+12,291	8¼	—
Blackburn	,, 14	869	+ 53	29	28,401	+ 2,877	13½	—
Blackpool ..	,, 13	668	+140	28	39,761	+ 5,619	8¼	—
,, —Fleetw'd	,, 15	340	+ 29	15	18,924	+ 203	7½	—
,, —Lytham	,, 13	308	— 75	50	20,043	+ 7,145	7½	—
Bolton	,, 9	1,823	+ 55	28	53,048	+ 505	25	—
Bournemouth ..	,, 12	1,009	+ 10	28	33,838	—	10½	—
Bradford	,, 8	4,548	+349	27	130,421	+22,936	50	—
Brighton	,, 16	989	+ 44	—	31,555	—	9	—
Bristol	,, 14	4 818	—230	—	—	—	28	—
Devonport ..	,, 7	520	— 32	40	21,710	+ 3,285	5	—
Dudley—Sto'rb'ge	,, 7	80	+ 9	40	35,479	+ 1,400	18½	—
Gateshead ..	,, 7	946	— 81	40	36,569	+ 1,466	10½	+ ½
Gr'n'k—Pt. Glsgw	,, 7	540	+ 25	40	23,481	+ 1,216	7½	—
Oldham—Ashton	,, 7	543	— 28	40	22,212	— 961	5	—
Potteries	,, 7	1,760	+ 22	40	68,563	+ 5,298	28½	—
South Staffs. ..	,, 7	80	—127	40	30,917	— 5,498	21½	— ½
Swansea	,, 7	526	+ 8	40	22,171	+ 1,018	5½	—
Wolverhampton ..	,, 7	392	— 1	40	15,854	— 41	10½	+8
Yorks. Wool Dist.	,, 7	559	+ 59	40	24,014	+ 8,781	6	—
Miscellaneous ..	,, 7	3,428	—	40	148,571	—	—	—
Burnley	,, 15	1,043	+288	—	—	—	10½	+2½
Burton-on-Trent ..	,, 16	825	— 36	28½	10,471	—	6½	—
Cardiff	,, 8	1,324	— 90	37	58,118	+ 1,771	14	—
Chatham & District	,, 13	577	+ 7	41	24,522	+ 2,150	9·83	—
Cork	,, 13	479	— 13	41	19,506	— 2,476	9·89	—
Dover	,, 15	209	— 6	41	9,218	— 207	8	—
Dublin	Oct. 14	4,948	+ 55	—	81,932	— 3,412	47	+ ½
East Ham	,, 15	644	+ 56	28	21,629	+ 1,470	6½	—
Glasgow	,, 15	14,564	+482	20	286,475	+16,043	71½	+5½
Halifax (2 weeks) ..	,, 5	2,880	+ 34	27	43,006	+ 3,415	33	+1½
Huddersfield ..	,, 15	1,269	+ 68	28	40,208	+ 2,758	28	—
Hull	,, 15	3,344	+784	28	62,787	+ 8,894	18	+9½
Ilkeston	,, 12	178	— 20	28	4,200	—	8·5	—
Ipswich	,, 15	417	—	28	15,166	—	10½	—
Isle of Thanet ..	,, 15	484	+ 39	41	31,792	+ 1,629	10½	—
Leeds	,, 8	5,741	+318	27	167,400	+10,065	89	+9
Liverpool	,, 8	10,724	+250	41	426,197	+12,350	108	—
London C. C. ..	,, 8	13,048	+2492	27	362,347	+72,981	47½	+7½
Manchester	,, 15	12,149	+694	28	392,076	+14,678	127½	+12½
Newcastle	,, 15	3,564	+ 62	—	—	—	17	—
Portsmouth	,, 15	1,740	+267	—	61,409	+ 5,116	14½	—
Salford	,, 10	4,040	+199	27	115,068	+ 7,491	30	—
Sheffield	,, 14	4,571	—270	29	137,899	+ 2,670	34½	+1½
Southampton ..	,, 6	982	— 19	27	28,279	— 1,918	9	—
Southend-on-Sea ..	,, 12	286	+ 39	28	11,803	+ 1,275	6½	—
Sunderland	,, 2	1,216	— 2	27	35,417	+ 390	21	+1
Tyneside	,, 13	366	+ 72	41	16,207	+ 2,686	8·9	+·4
West Ham	,, 13	1,083	—	33	30,560	—	9·78	—
Wolverhampton ..	,, 12	711	+268	—	—	—	9·5	—
Cen. London Rly. ..	,, 15	6,780	+387	15	90,551	— 244	6	—
City & S. Lon. Rly. ..	,, 16	2,586	—295	16	38,746	— 1,337	6½	—
Dublin—Lucan Rly. ..	,, 14	182	+ 10	15	2,145	— 20	6½	—
G. N. and City Ry. ..	,, 15	1,190	+ 13	35	34,130	—	3½	—
L'pool Overh'd Rly. ..	,, 16	1,458	—141	16	26,069	— 1,084	6½	+4½
Mersey Railway ..	,, 15	1,518	+186	15	21,891	+ 1,789	4½	—

* Compared with the corresponding period of 1903.

SIMPLE STORIES.

By "INNOCENS."

XI.—B'RER RABBIT'S BENEFICENCE.

B'RER RABBIT, he reckon he wanter sell his lighting station. De bizness was going berry strong, and de plant was in good ordah, considerin'. But B'rer Rabbit, he knew dat de plant was put up to last ten yeahs, an' no moah, an' he segashuate dat when dem ten years was up he orter be at de odder end ob de world, where dere wasn't no trubbles nor no depreshiashun accounts. So for a lil' time B'rer Rabbit he lay low, an' said nuffin'. But he thunk berry hard, did B'rer Rabbit, an' de fust thing he done was ter sack all his drivers 'ceptin' B'rer Tarrypin. He was a slow old stick, was B'rer Tarrypin, but he could be trusted ter do a lot ob work and say nuffin' about it. So he sez ter B'rer Tarrypin, sezee, "You are now my Chief Assistant, 'case there ain't anyone else on de job, and I expec' you to look after de place," sezee, "an' keep it respectable," sezee, "an' keep de costs down to de ground," sezee. "Ef you go through de winter to my satisfaction," sezee, "I'll gib you a nice rise ob two-and-six a week, and let you hab moah responsibility as you become useter it." An' B'rer Tarrypin, he wept tears ob joy ober de feet ob B'rer Rabbit, and wondered ef he could work hard enough ter keep his job.

At de end ob de week B'rer Tarrypin he went up fer his ushle allowance of waste. When B'rer Rabbit saw him coming he sang out, "Hullo, B'rer Tarrypin, what you awantin' now?" B'rer Tarrypin he bob his head an' asks for his waste. "Waste!" sez B'rer Rabbit, "Waste, when de American combine hab forced de price ob cotton up sky high? Go 'long an' find some ole sacks, an' clean de engines wid dat!" B'rer Tarrypin he scratch hisself berry thoughtful, but he went away and said nuffin' to nobody.

Day or two aftah, B'rer Tarrypin, he come up to B'rer Rabbit at quite a quick canter. "B'rer Rabbit," sezee, "de vacuum am fallin' rapid, an' de engine am pulling up," sezee. "What am I gwine ter do?" B'rer Rabbit, he lit out, and arrived on de scene ob excitement 'fore you could say Father Christmas or Lord Kelvin. Dere was plenty ob circulating water, nuffin' wrong wid de pump gear, but de vacuum, it kep' comin' back and comin' back till de ole engine was runnin' on de atmosphere, and de condenser was red hot. Den B'rer Rabbit he notice a funny soughin in de air pump, an' he se dat de red-lead on de joints was new. An' he turn to B'rer Tarrypin an' sez, "What hab you been adoin'?" An' B'rer Tarrypin he break out into teahs an' 'llow dat he took de hemp packing off'n de air-pump bucket to use fer waste, 'case he couldn't find nuffin' else. He reckon dat de plunger was such a close fit it didn't matter 'bout de packing. B'rer Rabbit, he get so mad he dassent speak, but he gib B'rer Tarrypin a woner dat lay him ober on his back. "Dat'll teach you to rob your own employer," sezee, "Nex' time youah in want ob anything," sezee, "go an' rob somebody else," sezee, "I don't mind dat," sezee.

Well, de next thing B'rer Rabbit did was ter go to de Secretary ob de Benevolent Home for Moultin' Birds, who was also President ob de Ratepayers' Association, and B'rer Rabbit sez, sezee, "Youahs am a berry laudable object," sezee. "As I pass along de fields an' de byeways in de autumn time," sezee, "an' see de poor birds losing dere fedders," sezee, "it fills me wid melancholy," sezee, "an' I hab often thought what a nice thing it was that dere was a good 'ome for dem to go to, if dey wanter," sezee, "where dey can get outer de way an' be at peace! I hab much pleasure," sezee, "in handing you a cheque for five pounds," sezee, "towards de expenses ob de Home for Moultin' Birds," sezee. An' de Secretary ob de Benevolent Home, he tell all de ratepayers in de Association what a berry nice pusson B'rer Rabbit was.

Den B'rer Rabbit, he go to ole Marm Goose, an' kidded her about de good looks ob de goslings till she was so pleased she dunno what ter do wid herself. Ole man Gander was de Mayor ob de community. Presently, B'rer Rabbit, he sez, sezee, "Youah husband am a berry progressive, keen, deep-thinkin', well read, sagacious, an' practical man, Mis' Goose," sezee. Ole Marm Goose, she looked pleaseder dan ebber, an' 'low dat ebbery word dat B'rer Rabbit say was de fac'. Den B'rer Rabbit say, "What he wants ter make hisself famous ter posterity fer ebber," sezee, "is ter initiate sumfin entirely new in municipal enterprise," sezee, "an' ter brand it wid his name," sezee. Ole Marm Goose, she look mystified but berry pleased. B'rer Rabbit go on—"Don't say anyfing to nobody," sezee, "least ob all ter youah husband," sezee, "fer fear he reckons you are interfering in mattahs you don' understand," sezee, "but ef youah husband was ter municipalise de electric lighting ob dis community," sezee, "think what a glorious thing ter talk about it would be fer him—an' you!"

"Oh lor! B'rer Rabbit," sez Marm Goose, "My husband he always consults me on business mattahs," sez she, "an' I'll mention it to him."

"Ef you do," sez B'rer Rabbit, "you'll nebber regret it 's long's you lib. Only don't mention my name in de mattah, 'case I'm not particularly anxious ter sell my lighting concern, an' I should knock up de price pretty high. Ef it *does* come off," and here B'rer Rabbit whispered berry confidential, "You shall hab a new bonnet from An Unknown Admirah."

Well, de upshot was dat dere was a berry strong and fervent agitation in de community ter hab de electric light all ter demselves. Fer once in dere existence de Town Council and de Ratepayers' Association agreed wid each other. De only person dat was unpopular was B'rer Rabbit, 'case he wouldn't sell nohow. He reckon he built de place an' it was just makin' a return for all his labour an' he didn't see why he should lose it all. Finally de community dey appointed a Board ob Arbitration ter bring B'rer Rabbit ter reason, and when dey had offered him de hull ob de initial cost ob de undertaking, wid 50 per cent. moah foh goodwill, an' £300 a year as consulting engineer, he let 'dem hab it, parting wid de deed ob sale wid teahs in his eyes, fer he said he felt as bad as ef he'd lost a child. An' dey made B'rer Tarrypin Borough Engineer, ter work under B'rer Rabbit's general instructions.

Well, de day after de sale, B'rer Rabbit came inter de station wid his bag packed an' his whiskers waxed, an' he goes an' slaps B'rer Tarrypin on de back an' sez "How do, Mistah Borough Engineer?" An' B'rer Tarrypin answers back, meek's ebber "Berry well tank you, B'rer Rabbit. How's you?"

"*I'm* all right," sez B'rer Rabbit. "I've drawn de money, and I've packed de bag, and I'm off foh a day or two's holiday aftah de strain. Don' enquire at de house ef anything breaks down an' you want me, 'case I shan't be dere. So 'long," and B'rer Rabbit he lopes off. Jest's he gets ter de door he turns back and sings out "Bye de by, B'rer Tarrypin, de boilah inspector am coming to-day, an' number two boiler shell am only an eighth thick due to corrosion. I'll leave you to settle dat mattah wid him. Den I s'pose you know dat de brickwork in number one boiler is jest coming down, and all de valves on de condenser need renewing, and dat new steampipe won't come in 'case dere's a mistake in de drawing, and dere am no cylinder oil in de stores, and I smelt a strong whiff ob burning shellac round de armature las' night, and B'rer Fox sez unless he gets his lights on again ter night he'll eat somebody? Dat's all, I think. Anyway, ef dere's anything else, don't try to get me on de telephone, 'case I'm just off ter Americky ter see de wonders ob de St. Louis Exposition."

And den he loped!

Acne in Chloride of Lime Works.—In the last report of the Royal Prussian "Regierungs und Gewerbe-Räte und Bergbehörden" (Government Factory and Mining Inspectors) for 1903, reference is made in the portion dealing with the district of Merseburg to the disease known as "Chlorakne" (acne produced by some chlorine compound, from which men suffer who are employed in the electrolytic works where chloride of lime is manufactured). It is stated that when the walls of the workshop are frequently lime-washed, and the floors kept moist by sprinkling them with milk of lime, and more particularly when the decomposing cells taken out of the baths are thoroughly rinsed with milk of lime, the faint odour of chlorine, which is otherwise always present, is entirely removed. This treatment seems to destroy the substance which actually causes the acne, for wherever it is carried out the disease has become much less common.

NEW PATENTS APPLIED FOR.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool, to whom all inquiries should be addressed.

22,440A. "Improvements in telephone switchboards." W. C. Fairweather. (The Kellog Switchboard and Supply Co., United States.) (Date applied for under Patents Rule 9, October 17th, 1903.) October 3rd. (Complete.)

21,157. "Improvements in electrical switches." H. W. Cox. October 3rd.

21,170. "Automatic trolley-pole adjuster for electric tramways." W. C. M. Pettingill. October 3rd.

21,211. "Method of regenerating negative accumulator plates of diminished capacity, or for avoiding the diminution in capacity of new plates." P. Kammerer. October 3rd.

21,217. "Improvements relating to automatic telegraphic apparatus." A. Damaskinos. October 3rd. (Complete.)

21,229. "Improvements in sockets or holders for incandescent electric lamps." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) October 3rd.

21,242. "Improvements in and connected with electric arc lamps." O. Gross. October 4th.

21,248. "An automatic contact make and break for electric ignitions for gas and other engines." H. F. Rogers and S. Edmonds. October 4th.

21,247. "Electric automatic alarm letter-box opening." D. P. Corbet and W. M. Hughes. October 4th.

21,259. "Improvements in electric switches." H. W. Cox. October 4th.

21,264. "Improvements in electric arc lamps." A. Eckstein and A. E. Angold. October 4th.

21,276. "Improvements in means of supplying and collecting electric current for driving electric trains and other vehicles." P. T. J. Estler. October 4th.

21,307. "A new or improved electricity meter." E. J. Javaux. October 4th.

21,310. "Improvements in smelting furnaces and electric stoves." W. Moseley. October 4th.

21,314. "Improvements in electric phase indicators." K. Edgcumbe and E. I. Everett. October 4th.

21,315. "Improvements in ground detectors and electric cut-outs." The British Thomson-Houston Co., Ltd. (The General Electric Co., U.S.) October 4th.

21,322. "Improved process for the etching of metal plates by the aid of electrolysis." O. C. Strecker and H. Strecker. October 4th. (Comp'ete.)

21,329. "Improvements in electric trolleys." T. Cowburn. October 5th.

21,332. "An improved method for attachment for receivers of telephones and the like." D. Thornicroft. October 5th.

21,334. "Improvements in seats for use on electric and other cars, vehicles, ships, and out-door purposes generally." F. Leese. October 5th.

21,340. "Improved means for producing electric light." C. F. Adams and L. R. Whitfield. October 5th.

21,382. "A new or improved method of operating telephonic exchange systems and apparatus therefor." A. T. M. Thomson and The Thomson-Davis Telephone System, Ltd. October 5th.

21,388. "Improvements in electric measuring instruments." The British Thomson-Houston Co., Ltd. (The General Electric Co., U.S.) October 5th.

21,400. "Improvements in, and relating to, electric traction systems." A. C. Eborall. October 5th.

21,401. "Improved method of effecting communication between telephone exchange and apparatus therefor." A. T. M. Thomson. October 5th.

21,402. "Improvements in electrodes for electric accumulators with invariable electrolyte." E. W. Jungner. (Date applied for under Patents Act, 1901, October 7th, 1903, being date of application in Sweden.) October 5th. (Complete.)

21,403. "A method for increasing the activity in electrode masses of badly conductive metallic oxides or hydrates in accumulators with invariable electrolyte." E. W. Jungner. (Date applied for under Patents Act, 1901, October 31st, 1903, being date of application in Sweden.) October 5th. (Complete.)

21,405. "Improvements in means for suspending overhead electrical conducting wires or cables." A. Kuchinka. October 5th.

21,409. "A new or improved appliance for use in indicating the presence of electricity." G. C. Shankster. October 6th.

21,415. "Improvements in the construction of electric tramways." S. G. Bennett. October 6th.

21,422. "Improvements in electrical switches." H. Nunns. October 6th.

21,425. "A device for covering and protecting the conductor, or 'live' rail, of electric railways, and a current collector arm to be used with the same." O. S. Gill. October 6th.

21,447. "Improvements in connection with electric railways." W. P. Nesbitt. October 6th.

21,455. "Electric time alarms." S. S. Bromhead. (The American Bank Protection Co., United States.) October 6th. (Complete.)

21,464. "Improvements in the art of electrotyping." J. A. Corey. October 6th.

21,513. "Improvements in the construction of electric accumulators." J. Marie de la Croix and H. F. Joel. October 7th.

21,519. "Improvements in starting apparatus for electromotors." C. Turnbull. October 7th.

21,523. "Improvements in arc lamp mechanism." G. O. Donovan. October 7th.

21,592. "Improvements in and relating to electric signs and illuminated devices." F. B. Felloes. October 7th.

21,548. "Improvements in or relating to electric light fittings." W. W. Strode. October 7th.

21,553. "Improvements in galvanic dry cells or batteries." W. Strickland. October 7th.

21,564. "Improvements in pillar brackets for the control gear of electrical or other mechanism." E. N. Bray, F. R. Markham, F. E. Reiss and Markham and Reiss, Ltd. October 7th.

21,566. "Improvements in the electro-deposition of copper and other metals." S. O. Cowper-Coles and The Metals Corporation, Ltd. October 7th.

21,567. "Improvements in removing metallic cylinders from mandrels on which they are electro-deposited." S. O. Cowper-Coles and The Metals Corporation, Ltd. October 7th.

21,580. "Improvements in or relating to contact devices for electric clocks." B. Gustafson and R. Carlstedt. (Date applied for under Patents Act, 1901, October 8th, 1903, being date of application in Sweden.) October 7th. (Complete).

21,601. "Improvements in trolley sheaves for engaging electric power wires, applicable also to sheaves and guide pulleys used with wire ropes, cables, and the like." B. Williams. October 8th.

21,622. "Improvements in electric ignition for internal combustion engines, and in apparatus therefor." R. Kennely. October 8th.

21,639. "Improvements in electrical condensers." Marconi's Wireless Telegraph Co., Ltd., E. Berry and H. A. E. Ewen. October 8th.

21,640. "Improvements in apparatus for wireless telegraphy." Marconi's Wireless Telegraph Co., Ltd., E. Berry and H. A. E. Ewen. October 8th.

21,641. "Improvements in safety devices in connection with radio-telegraphic transmission circuits." Marconi's Wireless Telegraph Co., Ltd., E. Berry and H. A. E. Ewen. October 8th.

21,642. "An electrical apparatus for adjusting tram rail points." J. E. Macaulay. October 8th. (Complete.)

21,648. "Improvements in trolley heads employed in electrical traction." H. James and A. West. October 8th. (Complete.)

21,672. "Improvements relating to electric batteries." H. H. Lake. (La Société Anonyme Le Carbone, France.) October 8th.

21,676. "Improvements in electrodes specially applicable to electric arc lamps." E. A. Carolan. (The General Electric Co., United States.) October 8th.

21,677. "Improvements in electrodes specially applicable to electric arc lamps." E. A. Carolan. (The General Electric Co., United States.) October 8th.

21,678. "Improvements in and relating to the construction of rotary members for dynamo electric-machines." The British Thomson-Houston Co., Ltd. (The General Electric Co., United States.) October 8th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool, price, post free, 9d. (in stamps).

1903.

Electric Lighting of Railway Trains. H. Leitner and R. N. Lucas. 18,581. August 28th.

Automatic Electro-Mechanical Cut-Out. J. E. Spagnoletti. 18,598. August 28th.

Support or Carrier for an Incandescent Electric Lamp. F. Taylor 18,602. August 28th.

Electric Lamps of the Character Known as Vapour Lamps or Vapour Arc Lamps. C. O. Bastian and A. E. Salisbury. 18,624. August 29th.

A Double Point for Electric Rails of the Conduit System so that the Car can always Pick Up the Current. A. C. Holbrow. 18,712. August 31st.

Electrical Switches. H. Crowe. 18,731. August 31st.

Electric Relays. J. T. Armstrong and A. Orling. 18,853. September 1st.

Selective Systems for Electrical Communication. S. A. Reed. 18,841. September 1st.

Guiding Trolley Heads along Frogs and Crossings Attached to Overhead Wires. H. Cooley. 19,053. September 4th.

Electrical Locking Apparatus for Railway Signals. W. R. Sikes, Jun. 19,092. September 4 h.

Improvements in Apparatus for Controlling the Working of Electrically-Driven Cars. Siemens Bros. & Co., Ltd., and F. Lydall. 19,172. September 5th.

Contacts Especially Suitable for Induction Coils. Marconi's Wireless Telegraph Co., Ltd. and E. Priddle. 19,015. September 3rd.

Insulation of Electric Conductors. E. S. Pinching and W. H. Walton. 19,367. September 8th.

Operating Vapour Electric Lamps from an Alternating Current Source. E. Weintraub. 19,454. (Date applied for under Patents Act, 1901, October, 19th, 1902, being date of application in United States.) September 9th.

Magnetic Excitation of Alternate and Three-Phase Current Machines. W. P. Thompson. 19,547. (Communicated.) September 10th.

Working of Points and Plough Guides on Electric or Cable Tramways or Railways. W. J. Stewart. 19,657. September 12th.

Rotary Electric Machines. H. Chitty. 19,522. September 10th.

Improvements in Controlling Apparatus for Electric Motors. B. G. Lamme. (Date applied for under Patents Act, 1901, September 29th, 1902, being date of application in United States.) 19,887. September 15th.

Alternating Current Induction Motors. L. J. Hunt and the Sandycroft Foundry Co., Ltd. 19,948. September 16th.

Brush Stock for Revolving Brushes driven by Electricity. J. Maclean. 20,015. September 17th.

Electrical Switches. A. D. Smith. 20,027. September 17th.

Electric Cable Terminal. T. Ballard and W. Howard. 20,012. September 17th.

Electric Lighting. B. G. Lamme. 20,128. September 29th.

A Rotary Hair Brush having Means whereby the Hair and Scalp can be Electrified. J. Maclean. 20,100. September 18th.

Armatures for Dynamos and Motors. J. Maclean. 20,101. September 18th.

Surface Contact and Like Systems of Electric Traction. W. S. Boult and C. R. Boult. 20,219. September 19th.

Switches having Combined Insulating and Conducting Portions. C. F. Ritchel. 20,291. September 21st.

Method of Producing Rapid Electrical Oscillations and Systems of Devices Therefor. F. Schrottke and Gesellschaft fur Drahtlose Telegraphie m.b.H. 20,405. September 22nd.

Fixing of Pulleys, Electric Wires and Such Like to Ceilings. C. McCallum and J. McGruther. 20,517. September 24th.

Improvements in Electric Switches. A. Eckstein and A. J. D. Krause. 20,528. September 24th.

Arm-support for Telephones. H. Ehretl. 20,547. September 24th.

Multipolar Dynamo-electric Machines. J. H. Holmes. 20,606. September 25th.

Attaching Electrical Insulators to Insulator Brackets. E. J. Chambers. 20,633. September 25th.

Attaching Insulators to the Tubular Arms of Telegraph and like Poles. E. J. Chambers. 20,634. September 25th.

Arc Lamps. W. T. Upton, J. E. Elliott and H. B. Pratt. 20,645. September 25th.

Lamp Casings and Reflectors Principally for Incandescent Electric Lamps. D. J. O'Brien and T. A. Rottanzi. 20,831. September 28th.

Electrolysis of Chlorides of the Alkalies. C. Kellner. 20,899. September 29th.

Insulated Electric Conductors and Method of Producing the same. J. A. Henny. 20,921. September 29th.

An Improved Electric Current Transformer. A. R. Muller. 20,926 September 29th.

Electric Current Regulators. S. E. Page. (The International Electric Controller Co., U.S.A.) 20,916. September 29th.

Telephone Connections on the Party Line System. H. Oppenheimer. Actiengesellschaft Mix & Genest, Germany.) 21,088. October 1st.

Dynamometers for Electric Currents. A. J. Boult. (M. E. Turner, United States.) 21,093. October 1st.

Alternate Current Meters. Compagnie pour la Fabrication des Compteurs et Materiel d'Usines a Gas. 21,208. October 2nd.